

NACHI

2017

Standard Hydraulic Equipment

NACHI-FUJIKOSHI CORP.



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NACHI

Standard Hydraulic Equipment

Using the NACHI Standard Hydraulic Equipment Catalog

As a comprehensive manufacturer of a full range of hydraulic equipment, Nachi-Fujikoshi manufactures, markets, and provides a wide range of other services for a full lineup of outstanding products.

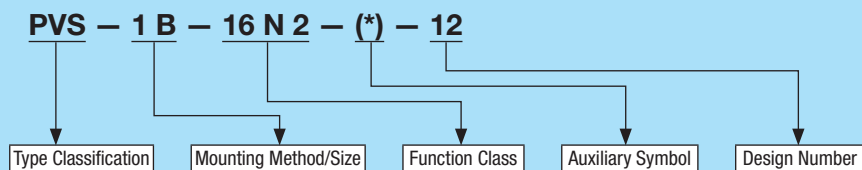
This general catalog introduces standard hydraulic equipment that has been carefully selected from the wide range of products manufactured by Nachi-Fujikoshi.

We hope that this catalog will be of assistance in planning your hydraulic system and for providing some guidelines for your inquiries about Nachi-Fujikoshi products.

■ Interpreting Model Numbers

Model numbers are assigned in accordance with Nachi-Fujikoshi standards as described below.

Example: PVS Series Variable Volume Piston Pump



(Note) Design numbers are always two digits.




A change in the right digit of the design number indicates there is no component compatibility. However, installation method compatibility still exists. This is subject to change without notice.

■ Using the Model Number Index

The Model Number Index at the back of this catalog lists the model numbers for NACHI standard hydraulic equipment. Use the index when looking up equipment details.

Hydraulic Equipment and Device Safety Precautions

- Before using any Nachi-Fujikoshi hydraulic equipment or device, carefully read the precautions and the "Handling" section for each of the standard hydraulic equipment products.
- Precautions are classified according to the three types described below. All three indicate important information that you need to know to ensure safety. Be sure to read all precautions and carefully follow the advice that they provide.

 Danger	This type of precaution indicates a condition in which incorrect handling creates the immediate risk of death or serious personal injury.
 Warning	This type of precaution indicates a condition in which incorrect handling creates the risk of death or serious personal injury.
 Caution	This type of precaution indicates a condition in which incorrect handling creates the risk of personal injury or material damage.









*Danger, Warning, and Caution precautions are not comprehensive. Other risks may exist, even though they are not specifically mentioned. Before actually using any Nachi-Fujikoshi product, be sure to read its user documentation. You should use the product or device only after you thoroughly understand its user documentation, always keeping safety first and foremost in your mind.

*Be sure that you always comply with the following laws in order to ensure safe operation of a product.






- High Pressure Gas Safety Law
- Industrial Safety and Health Act
- The Fire Laws

■ Hydraulic Operating Fluid Precautions



- Use of improper hydraulic fluid creates the risk of malfunction and breakdown.

 Danger	Many hydraulic operating fluids are flammable, so do not use open flame and do not perform welding in the vicinity of hydraulic devices and equipment. Failure to follow this precaution creates the risk of fire.
 Caution	Use only anti-wear type hydraulic operating fluid that is ISO3448 viscosity grade VG32 to VG68. Never use any other type of hydraulic operating fluid or fluid that is contaminated with foreign matter. Always check your user documentation for information before using non-mineral type hydraulic operating fluid (water based, synthetic, etc.)
 Caution	Use the proper type of hydraulic operating fluid, ensuring that oil temperature, viscosity, contaminant level, and other factors are all within their prescribed ranges. Using hydraulic operating fluid outside of its prescribed ranges creates the risk of fire due to operational problems, mechanical damage, and fluid leaks.
 Caution	Configure circuits and operate the system to ensure that the contamination level of the hydraulic operating fluid being used is always within the manufacturer's recommended values. Check the contamination level and the condition of the filter at regular intervals. Also periodically check hydraulic fluid for oxidation, deterioration, and moisture, and replace the hydraulic operating fluid whenever these levels exceed the recommended values of the fluid manufacturer.
 Caution	Whenever changing to another type of hydraulic operating fluid, be sure to thoroughly flush out the interior of the circuit. Never mix hydraulic operating fluids of different types. Continued use creates the risk of malfunction of and damage to the equipment.
 Caution	Make sure to avoid splashing hydraulic operating fluid on you and others. Should fluid get on your skin, wash the area thoroughly with soap and water. Allowing hydraulic operating fluid to remain on the skin creates the risk of rough skin.
 Caution	Before replacing the hydraulic operating fluid, allow the fluid in the system to cool sufficiently. Hot fluid creates the risk of burn injury.
 Caution	Allowing the hydraulic operating fluid level in the tank to become too low creates the risk of malfunction and breakdown.



■ Precautions when Preparing for a Test Run

 Warning	Always leave product installation, removal, piping, wiring, and other work up to specialists.
 Warning	Never attempt any unauthorized modification of the hydraulic system or control circuit.
 Warning	Never attempt any unauthorized modification of the setting values of the pressure and flow rate with adjusting devices.
 Caution	Always check new hydraulic devices for looseness of internal components that may have occurred during shipment and check to make sure that all components are fitted securely.
 Caution	Whenever suspending a product, make sure that you use all of the attached eye plates or eye bolts. Using any other method (such as using a single eye plate) to suspend the product creates the risk of it falling.


1. Checking the Product Model Number

 Danger	In any atmosphere where there is the danger of explosion or fire, be sure to use only products that are designed for operation in such atmospheres.
 Caution	Whenever installing a valve, pump, or motor, check its plate and engravings to confirm that it is the proper type. In many cases, you cannot tell the difference between different hydraulic equipment types by their outward appearance only.



2. Product Handling

 Caution	Never climb onto, strike, drop down, or apply excessive force to a product. Doing so creates the risk of malfunction, damage, fluid leaks, etc.
 Caution	Wipe up any hydraulic operating fluid that gets on the product or floor. Failure to do so creates the risk of personal injury due to the product slipping out of your hand and falling, and due to someone slipping on the fluid left on the floor.


3. External Piping

 Caution	<ul style="list-style-type: none"> • Be sure to perform sufficient flushing. • Anchor pipe supports to a secure surface. • Use pipe that has a sufficient pressure rating. (The rated pressure of the pipe should be quadruple the pressure that you plan to be using.) • The finish of the O-ring seal surface should be within the equivalent of 6.3S. Make sure there is no scratch, etc.
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4. Electrical

 Warning	Leave all electrical work up to a qualified professional. Be sure to turn off power before performing electrical work. Failure to do so creates the risk of electric shock.
 Warning	Failure to check the condition of the gate valve and relief valve when checking the rotation direction of a hydraulic pump creates the risk of accident, malfunction, and breakdown.



5. Coupling Alignment

 Caution	Though motor and pump shaft alignment is checked at the factory prior to shipment, they may go out of alignment during shipping or due to installation conditions. Because of this, you should always check for proper alignment during the test run.
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6. Valve, Pump, and Motor Installation

 Caution	Make sure installation holes and surfaces are clean. Insufficient tightening torque for bolt can allow fluid to leak, creating the risk of fire.
 Caution	Whenever installing a product, always use bolts of the specified strength and specified number, and tighten them to the specified torque. Failure to observe proper specified values during installation creates the risk of fire due to malfunction, mechanical damage, and hydraulic fluid leaks.
 Caution	During installation and removal, never strike the pump shaft or motor shaft with a hammer or otherwise subject them to impact. Doing so can damage the product.
 Caution	In the case of a pump or motor that requires a drain pipe, the drain pipe that is used should not allow the pressure inside the casing to exceed the specified value. In the case of a pump or motor structure where operating fluid needs to be filled within the casing during operation, use a drain pipe that constantly replenishes operating fluid but does not allow air to collect inside of the casing. The drain pipe also should not let the level of operating fluid inside of the case to drop (does not allow fluid to return to the tank) during long periods of non-operation.
 Caution	Check to make sure the check valve is attached in the correct direction. Attaching the check valve in the incorrect direction may create abnormal pressure.


7. High-pressure Restrictions

 Warning	When using a pump that does not have a pressure compensation function (with maximum pressure adjustment), be sure to install a hydraulic circuit maximum pressure regulating relief valve near the pump discharge side.
 Warning	When using a pump that has a pressure compensation function, piping capacity and additional conditions may delay the pump's response and cause pressure surges. Install a surge-cutting relief valve to limit the maximum pressure in the circuit if the surge pressure could exceed the maximum pressure of the hydraulic piping and hydraulic equipment.






8. Accumulator


 Warning	When using an accumulator, use only nitrogen gas. Be sure to read and understand all pertinent user documentation before using an accumulator.
 Warning	Never attempt to modify an accumulator by mechanical processing or welding.

9. Fluid Supply


 Caution	Supply fluid up to the standard quantity through the prescribed oil supply port. Take care to ensure that no foreign matter or moisture contaminates the fluid. Also, check to make sure that the standard oil quantity is maintained even when the actuator is operated.
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■ Precautions During a trial operation


 Warning	Authorized personnel only should be allowed in the vicinity of hydraulic devices during operation. Never touch devices during operation.
 Warning	Never remove covers of rotating parts nor operate hydraulic devices with covers open.
 Warning	Before turning on the power supply, first check to make sure that all operation switches are off.
 Caution	Start up a pump with no-load state, and check to make sure that the rotation direction is correct.
 Caution	Valves, pumps, and motor casings can become very hot during operation. Do not touch them.

 Caution	Should you ever notice abnormal noise, abnormal heat, abnormal vibration, leaking oil, smoke, abnormal odor, or anyother abnormal operation in a valve, pump, or motor, immediately shut down operation and take the necessary steps to correct the condition. Installation of sensors designed to detect abnormalities is recommended. Continued use under the above conditions creates the risk of damage, fire, and personal injury.
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1. Hydraulic Pump Operation


 Warning	Before starting operation, check to make sure that all stop valves are correctly open or closed as required. Particular attention is required in the case of the suction line and return line.
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 Caution	Though there is some vibration during normal operation, extreme vibration may indicate a defective fitting. Continued use creates the risk of accident or breakdown.
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 Caution	Use a current meter to check for abnormally high loads on the motor. A large load can indicate a defective fitting, sticking, etc. Correct the abnormality before operating the pump.
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2. Priming (Air Bleeding)

 Warning	Set the pressure to a value that does not operate the actuator (normally 0.5 to 1.5MPa). Perform operation carefully while monitoring the pressure with a pressure gauge.
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 Warning	When bleeding air while the actuator is being operated, be careful about the movement of the machinery. Shut down the machinery immediately whenever there is the danger of accident.
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 Caution	Performing work while operating fluid is below the prescribed level or using a mixture of different types of operating fluid creates the risk of malfunction or breakdown of the pump or other devices.
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3. Actuator Operation


 Warning	Operate the actuator manually at low speed for initial operation. While carefully observing the operation of the machinery, perform the sequence operation and automatic operation. Trying to perform the sequence operation and automatic operation for the initial operation creates the risk of unexpected accident and breakdown.
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4. Cleaning the Filter


 Caution	The filter can become clogged right from the first test run. Be sure to watch the filter indicator for signs of clogging. Continued use of a clogged filter creates the risk of unexpected accident and breakdown.
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5. Valve Control

All Valves


 Warning	Use valves within their prescribed maximum operating pressures (including surge pressure).
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 Warning	Sudden operation of the handle (screw) is dangerous. Be sure to unload the valve before gradually increasing pressure. Never keep a valve at a pressure that is greater than its design specification pressure value.
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 Warning	Make sure you understand the hydraulic circuit diagram and switching valve structure, and check the electrical operation circuit and solenoid valve before performing any operation. <ul style="list-style-type: none"> • An incorrect switching direction can cause reverse operation of the actuator and create the risk of unexpected accident and breakdown.
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 Warning	Make sure you understand the hydraulic circuit diagram and flow control valve structure before performing any operation. <ul style="list-style-type: none"> • Sudden operation can change the operating speed of the actuator and create the risk of unexpected accident or breakdown.
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Solenoid Valves, Proportional Valves, Servo Valves

 Warning	Use valves within their prescribed maximum operating pressures (including surge pressure).
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 Warning	Never charge both coils of a double solenoid valve at the same time.
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 Caution	The pump casing and solenoid coil surface can become very hot. Never touch them.
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 Caution	Be sure to use the appropriate model in environments that require water resistance.
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■ Maintenance Precautions During Normal Daily Operation

1. Operating Fluid


 Caution	In order to ensure proper performance of hydraulic devices, check the oil temperature, fluid level, and fluid color (for discoloration and deterioration) everyday. Any abnormalities create the risk of malfunction and breakdown.
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 Caution	Whitish fluid indicates that water has contaminated the fluid, and blackish fluid indicates that the fluid has been subjected to high temperatures. Replace the operating fluid whenever these symptoms are noticed.
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 Caution	Operating fluid that is below the prescribed level can cause improper pump suction. Keep fluid filled to prescribed level.
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 Caution	As it is used for normal operations, operating fluid deteriorates and gradually loses its rust prevention, lubrication, and anti-forming tendency. Deteriorated operating fluid creates the risk of malfunction and breakdown. As a general standard, replace operating fluid at least once a year.
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2. Hydraulic Pumps

 Caution	High temperature on the surface of pump indicates the possibility of malfunction and breakdown. Immediately shut down the pump and investigate the causes.
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3. Fluid Leakage

 Warning	Leakage from welding seam of piping, from a hydraulic pump, from hydraulic machinery, or from other sources creates the risk of serious accident. Always be cautious about the leakage strictly.
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4. Filters

 Caution	Continued use of a clogged filter creates the risk of unexpected accident and breakdown. Replace a filter as soon as possible after it shows signs of clogging. Never operate devices without filter elements.
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5. Pressure Gauges

 Caution	Always be sure to tighten the gauge cock whenever you do not need to check the pressure gauge. Vibration of the pointer can damage the pressure gauge.
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6. Tank

 Caution	It depends on the contamination level of the hydraulic fluid to make an inspection inside the tank. As a general standard, the tank should be emptied and cleaned up once a year.
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7. Hydraulic Devices

 Caution	Never allow cutting oil, grinding oil, clippings, water, or other similar matter to get on hydraulic devices.
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8. Coolers

 Caution	For a water cooler, adjust the temperature adjusting valve to keep the water temperature below 60°C. Install a fan cooler to allow proper intake, outflow, and flow of cooling air.
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■ Handling Precautions During Non-use

 Caution	If the system will not be operated for long periods, be sure to take proper anti-rust measures. <ul style="list-style-type: none">• Not operating the system for long periods without taking anti-rust measures creates the risk of malfunction and breakdown due to rust.• Be sure to flush the system before using it again after a long period of non-use. Failure to flush out anti-rust oil creates the risk of malfunction and breakdown.
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■ Disassembly and Inspection Work Precautions

 Warning	Never attempt to modify or reassemble valves, pumps, or motors. If not, it may cause the insufficient performance, and creates the risk of malfunction and breakdown.
 Warning	All disassembly and inspection should be left up to persons with required special knowledge for such work. Attempting disassembly without the required knowledge creates the risk of unexpected accident. Incorrectly performed disassembly and inspection work creates the risk of malfunction and breakdown.
 Warning	Before starting disassembly or maintenance work, make sure that all electrical breakers are cut off, and use an electroscope to check for the electricity. If not, it creates the risk of unexpected accident such as actuator runs out of control, electric shock, etc.
 Warning	Electricity work while turning on the power creates the risk of unexpected accident due to electric shock.
 Warning	Always make sure to release all residual pressure before starting disassembly work. Performing disassembly work without releasing residual pressure creates the risk of accident due to spurting fluid, the arbitrary movement of actuator, or dropping, and also creates the risk of malfunction and breakdown.
 Caution	Always place valves, pumps, and motors on a secure surface, and never place them on top of hydraulic machinery. If so, it creates the risk of damage to the hydraulic machinery.
 Caution	Never strike or drop valves, pumps, or motors, and never subject hydraulic equipment to strong external force.
 Caution	During reassembly, failure to tighten to proper torque and contaminants getting into piping creates the risk of malfunction and breakdown. <ul style="list-style-type: none">• Take care to ensure that the tightening torque is at prescribed level and equal level.• Take care that sealing materials, welding scales, and other contaminants do not get inside of piping.
 Caution	After disassembly and reassembly, double check to make sure that you did not forget to open stopper valves, and that you have properly tightened all bolts, stopper plugs, couplings, and other required parts before starting the first operation.

■ Storage Precautions

 Caution	Seals may need to be replaced before using a product for the first time after long storage.
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Standard Hydraulic Equipment Contents

[NACHI Hydraulic Pumps]

Hydraulic Pump Features or Handling	A-	1
Hydraulic Pump Selection Table	A-	2

A Piston Pumps

PVS—PVS Series Variable Volume Piston Pumps	A-	3
PZS—PZS Series Variable Volume Piston Pump	A-	22
PZ—PZ Series Load Sensitive Variable Piston Pump	A-	35

B Vane Pumps

VDS—VDS Series Small Variable Volume Vane Pump	B-	1
VDR-22D—VDR22 Design Series Variable Volume Vane Pump	B-	6
VDR-13D—VDR13 Design Series Variable Volume Vane Pump	B-	15
VDC—VDC Series High-Pressure Type Variable Volume Vane Pump	B-	25
VDC Series High-Pressure Type Variable Volume Double Vane Pump		
UVN—UVN Series Variable Volume Vane Uni-pump (NSP Uni-pump)	B-	40

C Gear Pumps

IPH—IPH Series IP Pump	C-	1
IPH Series Double IP Pump	C-	14

[NACHI Hydraulic Valves]

Hydraulic Valve Features or Handling	D-	1
Hydraulic Valve Selection Table	D-	2

D Modular Valve

Modular Valve Series	D-	4
G01 Modular Valve Series	D-	7
G03 Modular Valve Series	D-	9
G04 Modular Valve Series	D-	12
OR—Relief Modular Valve	D-	13
ORO—Brake Modular Valve	D-	19
ORD—Direct Relief Modular Valve	D-	23
OG—Pressure Reducing Modular Valve	D-	28
OGB—Balanced Piston Type Pressure Reducing Modular Valve	D-	35
OG—Pressure Reducing Modular Valve	D-	37
OGS—Two-Pressure Reducing Modular Valve	D-	44
OQ—Sequence Modular Valve	D-	47
OCQ—Counter Balance Modular Valve	D-	50
OW—Pressure Switch Modular Valve	D-	55
OY,OCY—Flow Regulator Modular Valve	D-	58
OF,OCF—Flow Control Modular Valve (Pressure and temperature compensated)	D-	66
OC,OCV—Check Modular Valve	D-	72
OCP—Pilot Operated Check Modular Valve	D-	79
OK—Gauge Modular Block	D-	84
OB—High-low System Block	D-	86
MOB—End Plate, Free Flow Plate, 03/01 Change Plate	D-	88
MSA,MDS—Solenoid Valve/Modular Valve Subplate	D-	90
OTH,OTD—Valve Installation Bolt List	D-	93
MOB—01, 03 Base Block	D-	96
—High-pressure M35 Series	D-	98

E Solenoid Valve

SS	SS Series (Wiring System: Central Terminal Box) Wet Type Solenoid Valve	E-	1	Piston Pumps
SA	SA Series (Wiring System: DIN Connector Type) Wet Type Solenoid Valve	E-	13	
SE	SE Series (Wiring System: Central Terminal Box) Lower Power Solenoid Valve	E-	25	Vane Pumps
SED	SED Series (Wiring System: DIN Connector Type) Lower Power Solenoid Valve	E-	32	
SL	SL Series (Wiring System: Central Terminal Box) Lower Power Solenoid Valve	E-	38	Gear Pumps
DSS	DSS (DSA) 22 Design Series Solenoid Control Valve	E-	45	
SF	Fine Solenoid Valve SF Series	E-	53	
SNH	SNH Series Non-leak Type Solenoid Valve	E-	57	Modular Valve
SAW	SAW Series Solenoid Valve With Monitoring Switch	E-	66	
SCW	SCW Series Poppet Type Solenoid Valve With Monitoring Switch	E-	75	

F Pressure Control Valve

R	Relief Valve	F-	1	
RI	RI Series Relief Valve (ISO Mounting, Balanced Piston Type)	F-	5	
RC,RCD	Remote Control Relief Valve	F-	8	
RSS,RSA	Solenoid Controlled Relief Valve	F-	10	
RIS	RI Series Solenoid Controlled Relief Valve	F-	15	
(C)G	Pressure Reducing (and Check) Valve	F-	18	Flow Control Valve
GR	Balancing Valve (Pressure Reducing and Relief Valve)	F-	23	
(C)Q	Pressure Control (and Check) Valve	F-	25	

G Flow Control Valve

(C)FR	Throttle (and Check) Valve	G-	1	
(C)FT	FT Type Flow Control (and Check) Valve (With Pressure and Temperature Compensation)	G-	4	Electro-hydraulic control valve
(C)F	F Type Flow Control (and Check) Valve (With Pressure Compensation)	G-	8	
(C)TN	TN Type Flow Control (and Check) Valve (Fine Adjustment Type With Pressure and Temperature Compensation)	G-	11	Hydro-logic Valve
(C)TS	TS Type Flow Control (and Check) Valve (Fine Adjustment Type With Pressure and Temperature Compensation)	G-	14	
TL,TLT	TL (TLT) Type Feed Control Valve (Fine Control Type With Pressure Compensation)	G-	16	Hydraulic Cylinder

H Direction Control Valve

CA,CN	Right Angle Check Valve In-line Check Valve	H-	1	Hydraulic Unit
CP	Pilot Check Valves	H-	4	
K2	Gauge Cock	H-	7	
DMA	DMA Type Manual Valve	H-	8	Hydraulic Accessories
	Flange Type Series	H-	10	

I Electro-hydraulic control valve

	Electro-hydraulic Proportional Valve Series	I-	1	Technical data
EPR	Electro-hydraulic Proportional Pilot Relief Valve	I-	2	
ER	Electro-hydraulic Proportional Relief Valve	I-	4	
EGB	Electro-hydraulic Proportional Relief and Reducing Valve	I-	6	
(C)ES	Electro-hydraulic Proportional Flow Control Valve	I-	8	
ESR	Load Response Electro-hydraulic Proportional Relief and Flow Control Valve	I-	11	
ESD	Electro-hydraulic Proportional Flow and Direction Control Valve	I-	14	
EOG	Modular Type Electro-hydraulic Proportional Reducing Valve	I-	22	
EOF	Modular Type Electro-hydraulic Proportional Flow Control Valve	I-	24	Model No. Index

EMA,EMC—Power Amplifier Series for Electro-hydraulic Proportional Valve Drive	I-	26
EBA—Small Type Power Amplifier Series for Electro-hydraulic Proportional Valve Drive	I-	30
EDA,EDC—Small Type Multi-function Power Amplifier	I-	34
ESH—High-response proportional flow control valve ESH-G01	I-	38
ESH—High-response proportional flow control valve ESH-G03, 04, 06	I-	40
EHA—High-speed Response Proportional Control Valve Amplifier EHA Series	I-	42
EA—Electro-hydraulic Servo Valve Driver Servo Amplifier	I-	44

J Hydro-logic Valve

Composite Valve Series Logic Valve	J-	1
--	----	---

K Hydraulic Cylinder

FJ—FJ Series General Purpose Hydraulic Cylinder	K-	1
---	----	---

L Hydraulic Unit

NCP Series (Standard Variable Pump Unit)	L-	1
NSP Series (Compact Variable Pump Unit)	L-	18
Inverter Drive NSP Series (Energy-saving Variable Pump Unit with Inverter Drive)	L-	24
NNP Series (Low-noise Standard Variable Pump Unit)	L-	28
Inverter Drive NCP/NSP Series (Energy-saving Variable Pump Unit with Inverter Drive) ...	L-	33
Power Meister	L-	35
Power Fit	L-	44

M Hydraulic Accessories

Hydraulic Accessories	M-	1
-----------------------------	----	---

N Technical data

Operating Fluid	N-	1
Water-Glycol Type Operating Fluid Hydraulic Devices	N-	3
SI Units and Conversion Formulas	N-	7

O Model No. Index

Model No. Index	O-	1
-----------------------	----	---

NACHI Hydraulic Pumps

Features

- ① NACHI-FUJIKOSHI guarantees the high quality and performance on all products through finishing with our unique and precise machining technology based on the selected material and traditional heat treatment.
- ② Noise has been thoroughly reduced on hydraulic pumps, a general source of noise on machinery and equipment. All models such as the low noise type IP series can be operated quietly with little noise.
- ③ Attention has been paid to surface treatment and selection of materials in NACHI hydraulic pumps so that they can be applied extensively with fire-resistant hydraulic fluid.

Installation and Maintenance

- ① Limit the eccentricity between the drive shaft and hydraulic pump shaft to 0.05 mm, keep the angle error within 1° and use flexible couplings for connections.
- ② On operating hydraulic pumps with belts, gears and chains, prevent a radial or thrust load exceeding the allowable value from being applied on the pump shaft. Also, if necessary, install a device that prevents a load (bending force) from being applied at right angles on the shaft. Mount hydraulic pumps so that the pump shaft is horizontal.
- ③ Use a rigid mounting base.
- ④ The direction of rotation is determined on each hydraulic pump. Operate the hydraulic pump in the correct direction of rotation after checking the indicated model No. on the nameplate or the arrow indicating the direction of rotation on the body. The direction of rotation is clockwise when viewed from the shaft end.
- ⑤ Limit the suction pressure to within the range -0.03 to +0.03 MPa {-0.3 to +0.3 kgf/cm²}.
- ⑥ On external drain type hydraulic pumps, directly connect the drain to the tank, insert the drain pipe under the oil level, and limit the drain back pressure to 0.03 MPa {0.3 kgf/cm²}.
- ⑦ When connecting steel pipes to the suction and discharge sides, Never apply the abnormal force to the pump by the piping.
- ⑧ Keep the fitting length of couplings and hydraulic pump shafts so that it is within at least 2/3 or more of the coupling width. Also, use a size of coupling that matches the shaft diameter.
- ⑨ When inserting couplings into shafts, insert them gently. When removing couplings from shafts, be sure to use a pulley extractor. Avoid hitting the

shaft when attaching or removing couplings.

- ⑩ Connect to the suction port above the horizontal to keep oil inside hydraulic pumps.
- ① Provide an air bleed valve in circuits where it is difficult to release air at startup.
- ② Be sure to use only specified bolts on hydraulic pumps. Use bolts of 12.9 strength classification or equivalent.

Uni-pumps

Uni-pumps are compact pump/motor units which have a motor directly coupled to the hydraulic pump. Variable volume type vane pumps and piston pumps are available. As each of these pumps are ideally integrated with the motor, they can be easily installed, and more compact equipment configurations can be achieved economically.

- Standard motor:
 - totally-enclosed splashproof housing surface flange cooled self-actuating type (totally enclosed fan-cooled type)
 - 0.4 kW to 4P or less: Class E insulation
 - 0.75 kW to 4P or more: Class B insulation
 - Voltage 200V...50/60 Hz
 - 220V...60 Hz

Management of Hydraulic Operating Fluid

- ① Use mineral oil-based hydraulic operating fluid.
- ② Provide a suction filter of about 100 to 150 mesh on the suction port.
- ③ When operating hydraulic pumps at a high pressure or when using fire-resistant hydraulic operating fluid, oil contamination greatly affect pump service life. So, use a filter of 25μm or less.
- ④ Consult your agent when using fire-resistant hydraulic operating fluid. When using water- or glycol-based hydraulic operating fluid, refer to page N-3 for details on applicable models of hydraulic pumps.
- ⑤ For details on the viscosity of hydraulic operating fluid, refer to the separate section "Hydraulic Operating Fluid."

Terms Used in This Catalog

The following describes the meanings of the following terms used in this catalog:

- Rated pressure:
 - The maximum pressure at which a hydraulic pump can be used continuously.
- Maximum operating pressure:
 - The maximum pressure (including surge pressure) at which a hydraulic pump can be used within six seconds at most within 1/10 of the cycle time.
- Allowable peak pressure:
 - The maximum pressure (set pressure + surge pressure) that can be momentarily allowed
- The following shows the standards in Lists of Sealing Parts:
 - JIS standard B2401 (O-ring)
 - JIS standard B2407 (backup ring)
 - SAE standard AS568 (O-ring)
- Pipe thread type mentioned in this catalog that are indicated as "G*/**" comply with JIS B2351 O-ring seal systems. Note, however, that G3/4 adopts dimensions before JIS revisions were made in 1990. Nachi Fujikoshi adopts P24 as the O-ring size whereas P22.4 is stated in current JIS standards.

Calculation Formula Required when Selecting Hydraulic Pumps and Motor

1. Pump discharge flow rate

$$Q_p = \frac{q \cdot N \cdot \eta_v}{1000} \quad (\ell/\text{min})$$

q=discharge volume per rotation (cm³/rev)

N=revolution speed(min⁻¹)

η_v=volume efficiency

2. Power required for pump drive

$$W_{P1} = \frac{P \cdot Q_p}{60 \eta} \quad (\text{kW})$$

$$= \frac{P \cdot Q_p}{44 \eta} \quad (\text{PS})$$

P=discharge pressure(MPa)

η=overall efficiency

3. Motor revolution speed

$$N = \frac{120 \cdot f}{P} \cdot (1-S) \quad (\text{min}^{-1})$$

f=frequency(50Hz, 60Hz)

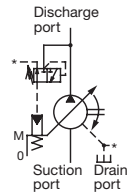
P=number of motor poles

S=slip rate

Hydraulic Pump Selection Table

Pump Type	Name	Type Classification	Rated Pressure MPa {kgf/cm ² }	Displacement cm ³ /rev											Page		
				1	2	5	10	20	50	100	200	500	1000	2000		5000	
Variable piston pumps	PVS series variable piston pump	PVS	21 {214}		3									45			A-3
	Uni-pump	UPV	21 {214}		3									45			A-19
	PZS series variable piston pump	PZS	21 {214}							42					220		A-22
	PZ load-sensitive variable piston pump	PZ	21 {214}			8									220		A-35
Variable discharge volume vane pumps	VDS series compact variable vane pump	VDS	7 {71.4}		3									8.3			B-1
	Uni-pump	USV	7 {71.4}		3									8.3			B-4
	VDR22 design series variable vane pump	VDR	14 {143}			5									44.4		B-6
	Uni-pump	UVD	7 {71.4}			5									33.3		B-12
	VDR13 design series variable vane pump	VDR	6 {61.2}			4									27.8		B-15
	Uni-pump	UVD	6 {61.2}			4									27.8		B-22
	VDC series high-pressure variable vane pump	VDC	14 {143}			5									88.9		B-25
	Uni-pump	UVC	7 {71.4}			5									33.3		B-37
	UVN series variable vane uni-pump	UVN	8 {81.6}			8.1									26.0		B-40
Internal gear pump	IPH series IP pump	IPH	25 {255}						3.6						125.9		C-1
	IPH series double IP pump	IPH	21 {214}						7.2						251.8		C-14

PVS Series Variable Volume Piston Pumps 8.0 to 45.0cm³/rev 21MPa



- ❖ Design No. 30 is applied on PVS-0B to make the pump more compact and lighter, and reduce noise.
- ❖ Production of PVS-3B has been discontinued. Use PZS-3B.
- ❖ Pressure adjustment 3 type has been added to PVS-1B-22 and PVS-2B-45. (Design No. 20 is applied only on PVS-2B-45*3.)

Features

Energy-saving Type with Drastically Reduced Loss

A NACHI-proprietary semi-circular barrel swash plate that receives pressure on its surface ensures a stable discharge volume at all times. This eliminates excess

discharge volume, and enables the effective use of power corresponding to the load cycle.

This "energy-saving type" conserves energy, reduces power loss, and helps to reduce hydraulic costs.

Silent Type That Demonstrates Its Power Quietly

Proprietary low-noise mechanisms are incorporated on the shoe, swash plate, valve plate, and other locations to ensure silent operation. In particular, a semi-circular barrel swash plate stabilizes operation characteristics to ensure silent operation.

Specifications

Model No.	Volume cm ³ /rev	Discharge volume at no-load ℓ/min				Pressure adjustment range MPa {kgf/cm ² }	Permitted peak pressure MPa {kgf/cm ² }	Rotating speed min ⁻¹		Mass kg
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
PVS-0B-8*0-30 1 2 3	8.0 (3.0 to 8.0)	8.0	9.6	12.0	14.4	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143} 3 to 21 {30.6 to 214}	25 {255}	500	2000	7.7
PVS-1B-16*0-(*)-12 1 2 3	16.5 (5.0 to 16.5)	16.5	19.8	24.7	29.7	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143} 3 to 21 {30.6 to 214}	25 {255}	500	2000	10.5
PVS-1B-22*0-(*)-12 1 2 3	22.0 (7.0 to 22.0)	22.0	26.4	33.0	39.6	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143} 3 to 21 {30.6 to 214}	25 {255}	500	2000	10.5
PVS-2B-35*0-(*)-12 1 2 3	35.0 (8.0 to 35.0)	35.0	42.0	52.5	63.0	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143} 3 to 21 {30.6 to 214}	25 {255}	500	2000	21
PVS-2B-45*0-(*)-12 1 2 3-(*)-20	45.0 (11.0 to 45.0)	45.0	54.0	67.5	81.0	2 to 3.5 {20.4 to 35.7} 2 to 7 {20.4 to 71.4} 3 to 14 {30.6 to 143} 3 to 21 {30.6 to 214}	25 {255}	500	2000	21

Note) Direction of rotation is clockwise when viewed from the shaft end.

- Handling
- Cautions during Pump Installation and Piping

- 1 Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent a radial or thrust load from being applied on the pump shaft.
- 2 For centering of the pump shaft, limit the eccentricity between the drive shaft and hydraulic pump shaft to 0.05 mm, and keep the angle error within 1°.
- 3 Set the length of insertion between coupling and hydraulic pump shafts so that it is within at least 2/3 or more of the coupling width.
- 4 Use a sufficiently rigid pump mounting base.
- 5 Set the pressure on the pump suction side to -0.03 MPa or more (suction port flow velocity within 2 m/sec).
- 6 Raise part of the drain piping to above the topmost part of the pump body, and insert the return section of the drain

piping into the hydraulic fluid. Also, observe the values in the following table to limit the drain back pressure to 0.1 MPa.

Model No.	PVS-0B	PVS-1B	PVS-2B
Pipe joint size	3/8" or more	1/2" or more	
Pipe I.D	φ7.6 dia or more	φ12 dia or more	
Pipe length	1m or less	1m or less	

- 7 Mount the pump so the pump shaft is oriented horizontally.

● Management of Hydraulic Operating Fluid

- 1 Use good-quality hydraulic operating fluid, and use within a kinematic viscosity range of 20 to 200 mm²/sec during operation. Use an R&O type and anti-wear hydraulic fluid of ISO-VG32 to 68. The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.

- 2 The operating temperature range is 5 to 60°C. When the oil temperature at start-up is 5°C or less, warm up the hydraulic pump by low-pressure, low-operation speed operation until the oil temperature reaches 5°C.

- 3 Provide a suction strainer with a filtering grade of about 100μm (150 mesh). Be sure to provide a return line filter of grade 20μm or less on the return line to the tank. (When the hydraulic pump is used at a high pressure of 14 MPa or more, we recommend providing a filter of 10μm or less.)

- 4 Manage the hydraulic operating fluid so that contamination is maintained at class NAS10 or lower.

- 5 Use hydraulic operating fluid within an operating ambient temperature of 0 to 60°C.

(continued on following page)

● Inverter Drive Precautions

- 1 Set the revolution speed within the range of the pump specification revolution speed.
- 2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

● Cautions at Startup

- 1 Before you start pump operation, fill the pump body with clean hydraulic fluid via the lubrication port.

Model No.	Injection amount cm ³
PVS-0B-8	220
PVS-1B-16, 22	300
PVS-2B-35, 45	650

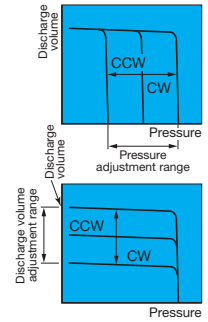
- 2 An unload is required when the motor is started under condition λ-Δ. Consult your agent regarding the circuit.

- 3 Make sure that the pump operates in the direction of rotation the same as that indicated by the arrow on the pump body.
- 4 Air entering to the pump or pipes may cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to release any air in the pump or pipes.
- 5 Provide an air bleed valve in circuits where it is difficult to release air at startup. (See "IP Pumps" on page C-13.)

● How to Set Pressure and Discharge Volume

For the factory default pump discharge volume is set to "maximum" and discharge pressure is set to "minimum". Change the discharge volume and discharge pressure settings according to your particular operating conditions.

[Pressure adjustment]
Turning the pressure adjusting screw CW increases the pressure.



[Discharge volume adjustment]
Turning the flow rate adjusting screw CW decreases the discharge volume.

Note)

- For details regarding the relationship between flow rate adjustment length ℓ and pump capacity q , see the tables provided in the installation dimension drawings for each of the pumps.
- Firmly tighten the lock nuts after you have finished adjustments.

[Note]

● Variable control mechanism

Standard type

N* : Pressure compensation type (manual mode)

Option type

P* : Pressure compensation type (remote control mode)

N*Q* : 2-pressure, 2-flow rate control

R^AS[⊗] : Solenoid cutoff control

W^AS[⊗] : 2-pressure control

RQ^AS[⊗] : 2-pressure, 2-flow rate control w/ solenoid cutoff

C^AS[⊗] : 2-cutoff control

● * : Pressure adjustment range

- 0 : 2 to 3.5MPa {20.4 to 35.7kgf/cm²}
- 1 : 2 to 7MPa {20.4 to 71.4kgf/cm²}
- 2 : 3 to 14MPa {30.6 to 143kgf/cm²}
- 3 : 3 to 21MPa {30.6 to 214kgf/cm²}

● ⊗ : Applicable to solenoid specifications A, S

A[⊗]: SA-G01

S[⊗]: SS-G01

1 : 100V 50/60Hz

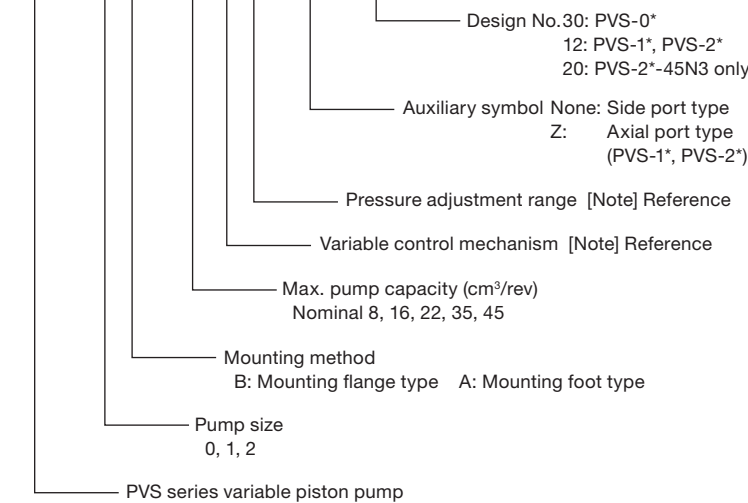
2 : 200V 50/60Hz

3 : DC12V

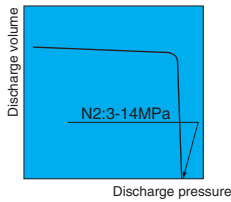
4 : DC24V

Explanation of model No.

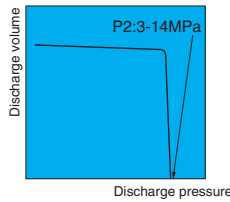
PVS - 1 B - 16 N 2 - (*) - 12



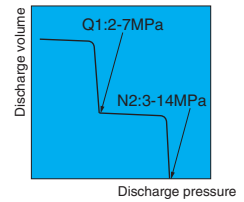
[Example 1]
N*: Pressure compensation type (manual mode)
PVS-1B-16N2



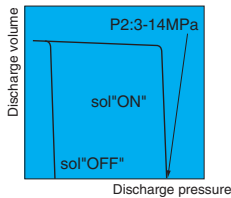
[Example 2]
P*: Pressure compensation type (remote control mode)
PVS-1B-16P2



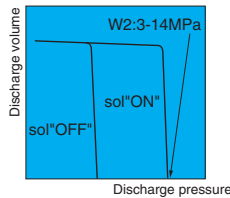
[Example 3]
N*Q*: 2-pressure, 2-flow rate control
PVS-1B-16N2Q1



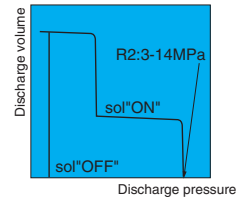
[Example 4]
R^AS[⊗]: Solenoid cutoff control
PVS-1B-16R2S2
Solenoid specifications
200V 50/60Hz
SS-G01



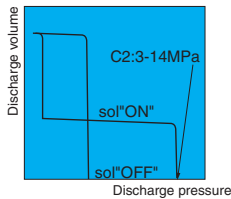
[Example 5]
W^AS[⊗]: 2-pressure control
PVS-1B-16W2S1
Solenoid specifications
100V 50/60Hz
SS-G01



[Example 6]
RQ^AS[⊗]: 2-pressure, 2-flow rate control w/ solenoid cutoff
PVS-1B-16RQ2S1
Solenoid specifications
100V 50/60Hz
SS-G01



[Example 7]
C^AS[⊗]: 2-cutoff control
PVS-1B-16C2S2
Solenoid specifications
200V 50/60Hz
SS-G01



■ NQ, RS, WS, RQS and CS types are not available for the PVS-0B-8.

■ NQ, RQS and CS types are not available for the PVS-1B-16-Z and PVS-2B-35-Z.

Variable Control Mechanisms

Standard type

Symbol	External View	Characteristics	Hydraulic Circuit	Explanation
N				<p>Pressure compensation type (manual system)</p> <p>When the discharge pressure reaches the preset pressure set by the pressure compensator, the discharge rate is automatically reduced to hold the pressure at the set pressure (full cutoff pressure).</p>

Option type

P				<p>Pressure compensation type (remote control mode)</p> <p>This mode demonstrates the same characteristics as the manual mode.</p> <p>The full cutoff pressure can be adjusted by external pilot pressure. The discharge rate can be adjusted manually. Note 2)</p>
NQ				<p>2-pressure, 2-flow rate control type</p> <p>The discharge volume changes in two stages by the pump's built-in sequence valve. This allows conventional high/ low pressure control to be performed on a single pump unit, and save energy in the hydraulic circuit.</p>
RS (RA)				<p>Solenoid cutoff control type</p> <p>A solenoid valve for unload is integrated into the pressure compensation type to minimize energy loss when pump output is not required. Only a slight amount of heat is generated.</p>
WS (WA)				<p>2-pressure control type</p> <p>Two pressure compensation types can be obtained by switching the solenoid valve ON/OFF.</p> <p>Two types of pressure control are possible with the actuator set to a constant speed.</p>
RQS (RQA)				<p>2-pressure, 2-flow rate control type w/ solenoid cutoff</p> <p>The discharge volume can be changed in two stages by the sequencer valve and solenoid valve for unload mounted on the pump, and unloading is possible when pressure oil is not required.</p>
CS (CA)				<p>2-cutoff control type</p> <p>Two types of pressure - flow rate characteristics can be obtained by the solenoid valve and cylinder mounted on the pump.</p>

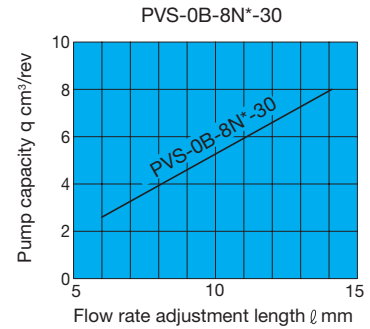
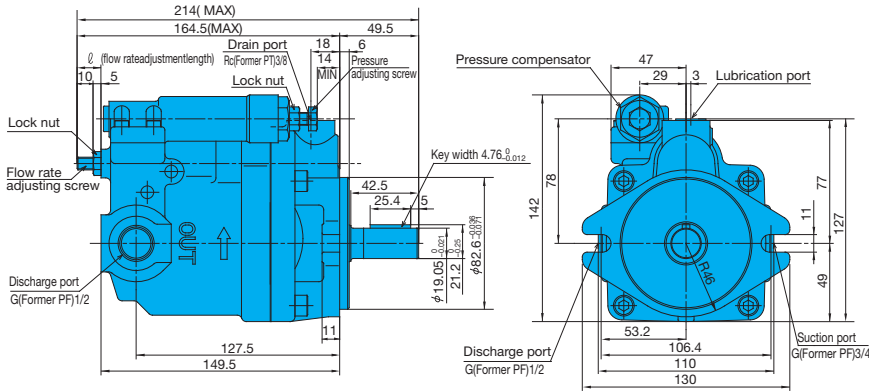
Note 1) Many other variable control mechanism are also available in addition to those in the above table. Please consult your agent for details.
 Note 2) We recommend ZR-T02-*5895* as the remote control valve. For details, consult your agent. The pipe volume up to the remote control valve should be less than 150cm³.

Pressure Compensation Type

Manual mode: standard type

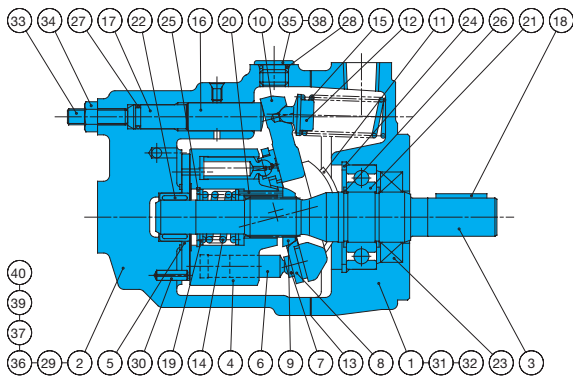
PVS-0B-8N*-30

Installation Dimension Drawing



Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

Cross-sectional Drawing



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	15	Spring S	29	Parallel pin
2	Case	16	Control piston	30	Spring pin
3	Shaft	17	Guide pin	31	Hexagon socket head bolt
4	Cylinder barrel	18	Parallel key	32	Cross-recessed countersunk head screw
5	Valve plate	19	Retainer	33	Hexagon socket set screw
6	Piston	20	Needle	34	Hexagon nut
7	Shoe	21	Ball bearing	35	Hexagon plug
8	Shoe holder	22	Needle bearing	36	Metal plug
9	Barrel holder	23	Oil seal	37	Nameplate
10	Swash plate	24	Snap ring	38	Lubrication port plate
11	Thrust bush	25	Snap ring	39	CAUTION plate
12	Spring holder	26	Snap ring	40	Rivet
13	Gasket	27	O-ring		
14	Spring C	28	O-ring		

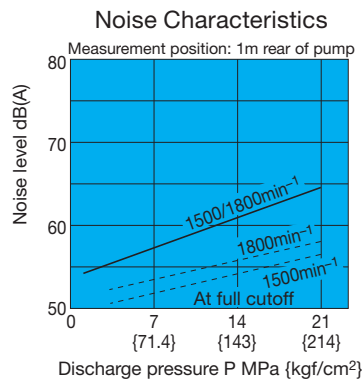
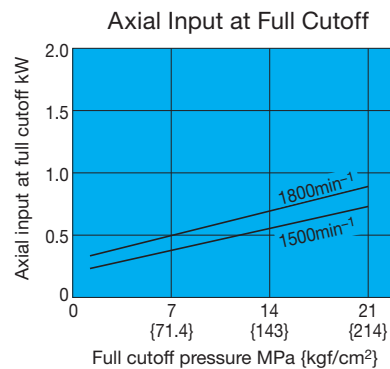
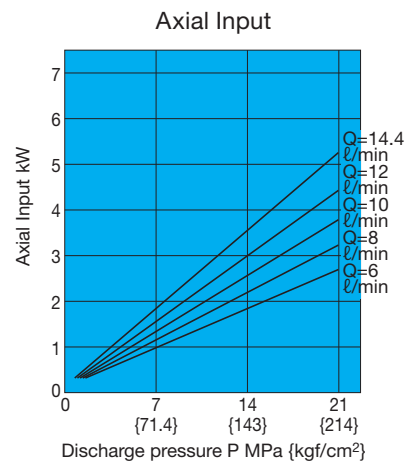
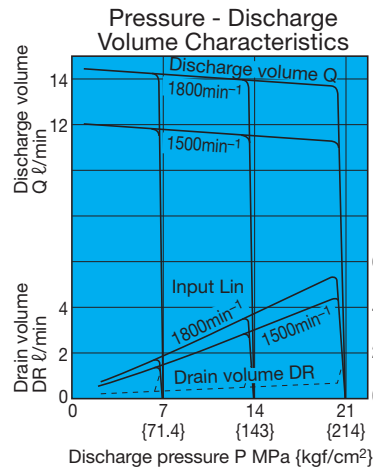
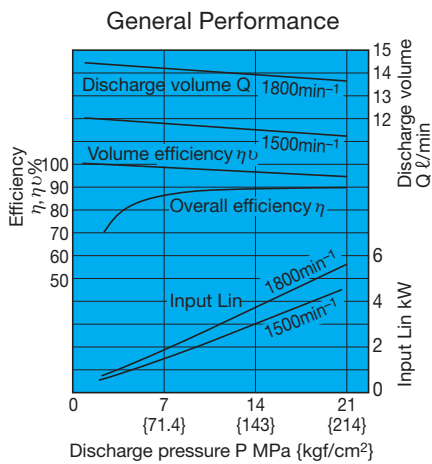
List of Sealing Parts (Kit Model Number PSCS-100000)

Part No.	Part Name	Q'ty	PVS-0B-8	
			Size	Remarks
13	Packing	1	PSC46-100000	3 Bond
23	Oil seal	1	TCV-254511-V	N.O.K
27	O-ring	1	NBR-90 P9	JIS B 2401
28	O-ring	1	NBR-90 P11	JIS B 2401

Parts marked by an asterisk "*" are not available on the market. Consult your agent.

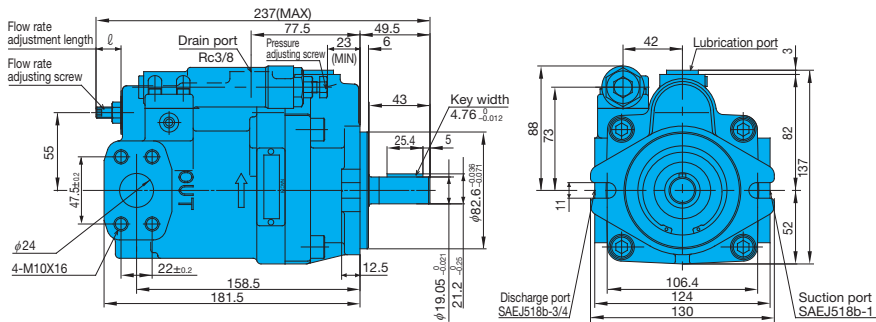
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

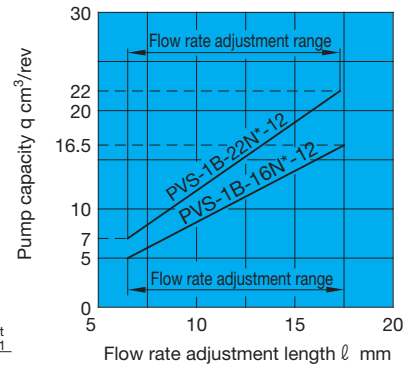


Installation Dimension Drawings

PVS-1B-16¹⁶/₂₂N*(Z)-12
(side port type)

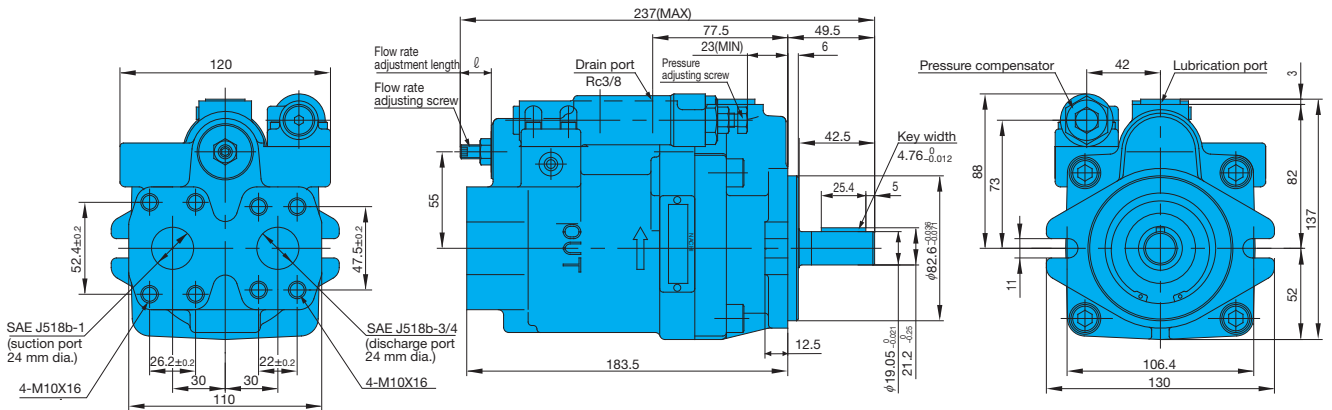


Relationship between flow rate adjustment length (ℓ) and pump capacity (q)

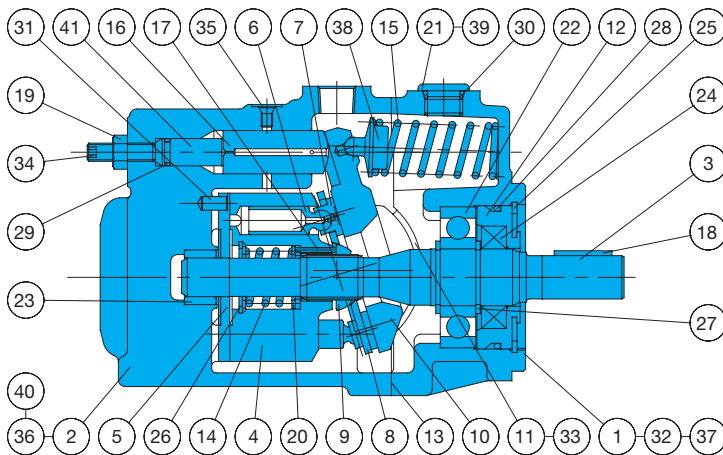


Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

(axial port type)



Cross-sectional Drawing



Part No.	Part Name	Part No.	Part Name
1	Body	22	Ball bearing
2	Case	23	Needle bearing
3	Shaft	24	Oil seal
4	Cylinder barrel	25	Snap ring
5	Valve plate	26	Snap ring
6	Piston	27	Snap ring
7	Shoe	28	O-ring
8	Shoe holder	29	O-ring
9	Barrel holder	30	O-ring
10	Swash plate	31	Pin
11	Thrust bush	32	Hexagon socket head bolt
12	Seal holder	33	Cross-recessed countersunk head screw
13	Gasket	34	Hexagon socket set screw
14	Spring C	35	Metal plug
15	Spring S	36	Nameplate
16	Control piston	37	CAUTION plate
17	Needle	38	Spring holder
18	Key	39	Lubrication port plate
19	Nut	40	Rivet
20	Retainer	41	Guide pin
21	Plug		

List of Sealing Parts (Kit Model Number PSS-101000-2A)

Part No.	Part Name	Q'ty	Size	Remarks
13	Gasket	1	PSC46-101000	Nihon Gasket
24	Oil seal	1	TCN-254511-V	N.O.K
28	O-ring	1	NBR-90 G55	JIS B 2401
29	O-ring	1	NBR-90 P9	JIS B 2401
30	O-ring	1	NBR-90 P14	JIS B 2401

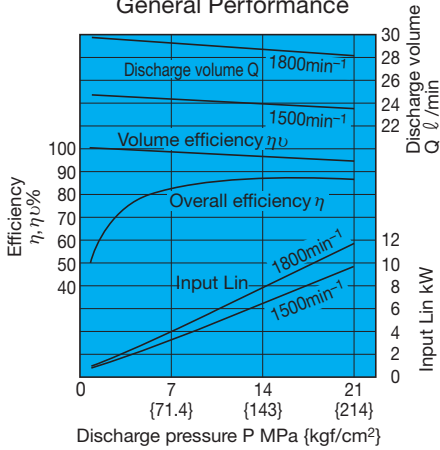
Parts marked by an asterisk "*" are not available on the market. Consult your agent.

Performance Curves

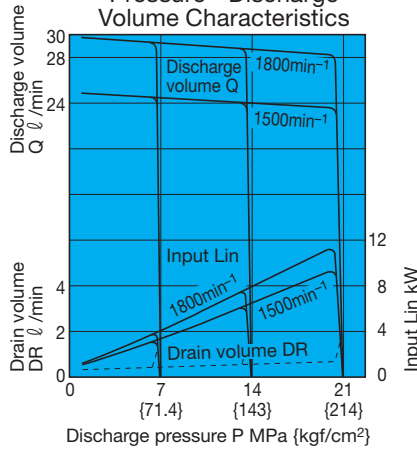
Typical characteristics at hydraulic fluid kinematic viscosity of 32 mm²/s

PVS-1B-16N*(Z)-12

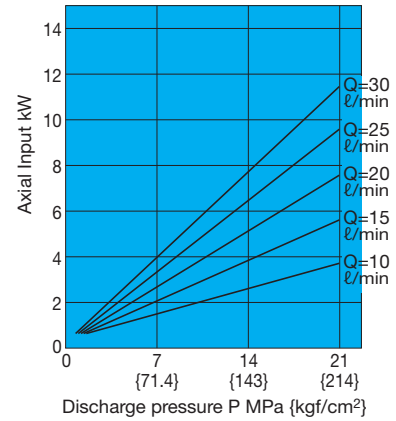
General Performance



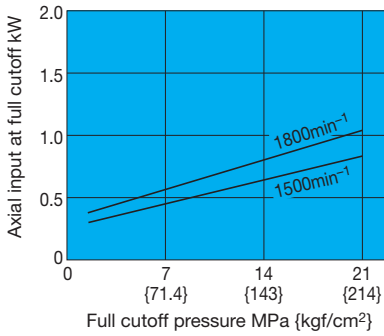
Pressure - Discharge Volume Characteristics



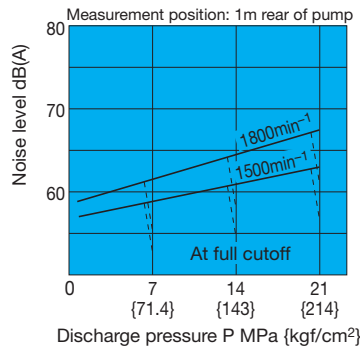
Axial Input



Axial Input at Full Cutoff



Noise Characteristics

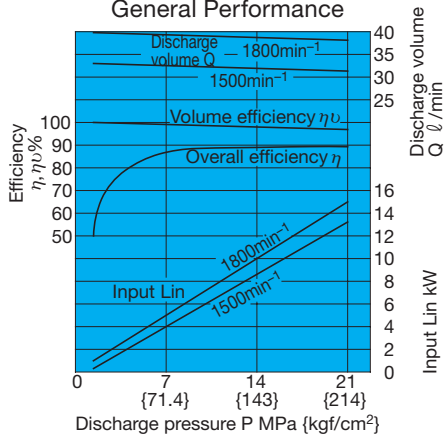


Performance Curves

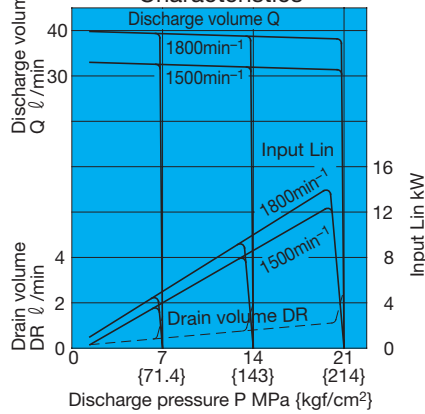
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-1B-22N*(Z)-12

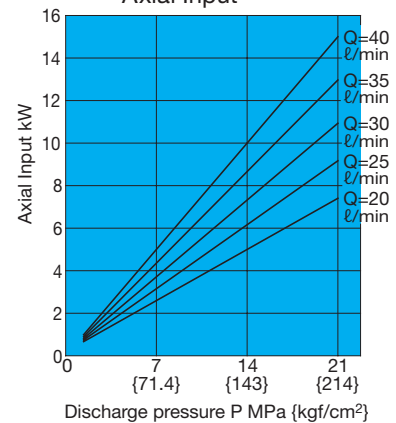
General Performance



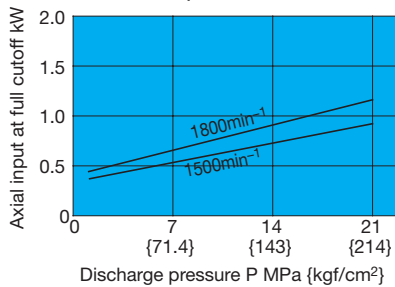
Pressure - Flow Rate Characteristics



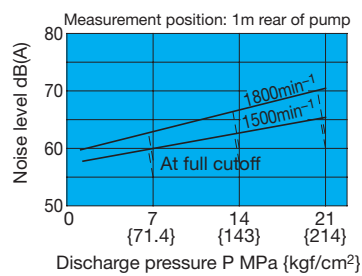
Axial Input



Axial Input at Full Cutoff

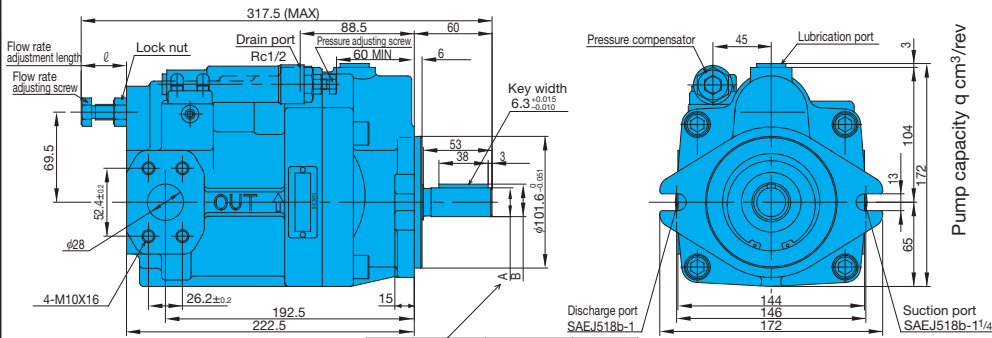


Noise Characteristics



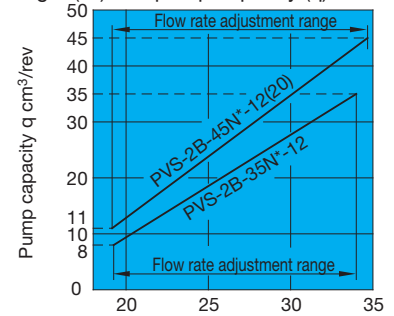
Installation Dimension Drawings

PVS-2B-³⁵/₄₅N*(Z)-12(20)
(side port type)



cm/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 _{-0.021}	24.9 _{-0.5}
45	0 to 2	3	φ25.385 _{-0.025}	27.85 _{-0.25}
			20D	φ25.385 _{-0.025}

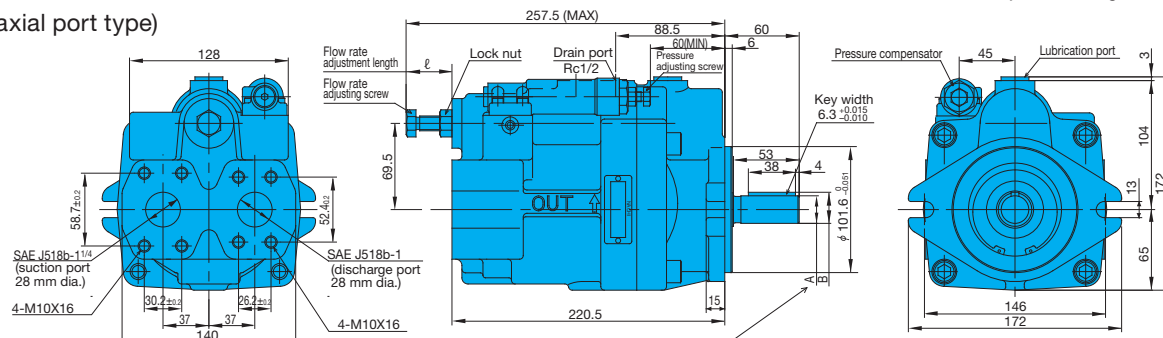
Relationship between flow rate adjustment length (ℓ) and pump capacity (q)



Flow rate adjustment length ℓ mm

Set a flow rate adjustment length within the above range. Oil will leak if the pump is operated below the adjustment range lower limit.

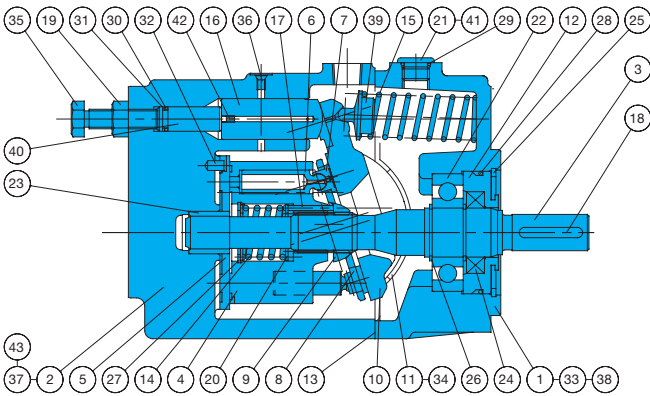
(axial port type)



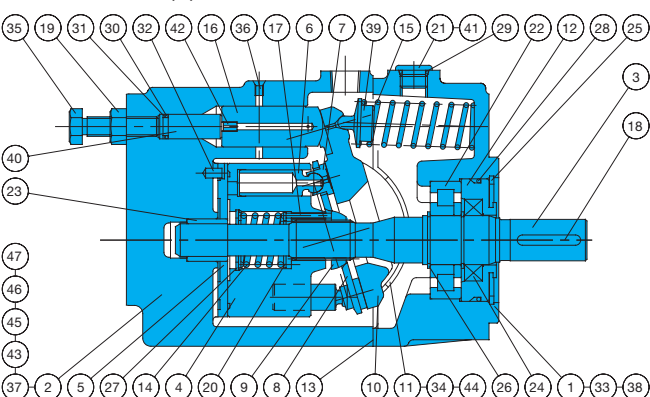
cm/rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 _{-0.021}	24.9 _{-0.5}
45	0 to 2	3	φ25.385 _{-0.025}	27.85 _{-0.25}
			20D	φ25.385 _{-0.025}

Cross-sectional Drawings

PVS-2B-³⁵/₄₅N*(Z)-12



PVS-2B-45N3(Z)-20



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Control piston	31	Backup ring
2	Case	17	Needle	32	Pin
3	Shaft	18	Key	33	Hexagon socket head bolt
4	Cylinder barrel	19	Nut	34	Cross-recessed countersunk head screw
5	Valve plate	20	Retainer	35	Flow rate adjusting screw
6	Piston	21	Plug	36	Metal plug
7	Shoe	22	Ball bearing	37	Nameplate
8	Shoe holder	23	Needle bearing	38	CAUTION plate
9	Barrel holder	24	Oil seal	39	Spring holder
10	Swash plate	25	Snap ring	40	Guide
11	Thrust bush	26	Snap ring	41	Lubrication port plate
12	Seal holder	27	Snap ring	42	Orifice
13	Gasket	28	O-ring	43	Rivet
14	Spring C	29	O-ring		
15	Spring S	30	O-ring		

List of Sealing Parts (Kit Model Number PSS-102000-2A)

Part No.	Part Name	Q'ty	PVS-2B-35/45	
			Size	Remarks
13	Gasket	1	PS46-102000-0A	Nihon Gasket
24	Oil seal	1	TCN-305011-V	N.O.K
28	O-ring	1	1B-G70	JIS B 2401
29	O-ring	1	1B-P14	JIS B 2401
30	O-ring	1	1B-P11	JIS B 2401
31	Backup ring	1	T2-P11	JIS B 2407

Parts marked by an asterisk *** are not available on the market. Consult your agent.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	17	Needle	33	Hexagon socket head bolt
2	Case	18	Key	34	Cross-recessed countersunk head screw
3	Shaft	19	Nut	35	Flow rate adjusting screw
4	Cylinder barrel	20	Retainer	36	Metal plug
5	Valve plate	21	Plug	37	Nameplate
6	Piston	22	Roller bearing	38	CAUTION plate
7	Shoe	23	Needle bearing	39	Spring holder
8	Shoe holder	24	Oil seal	40	Guide
9	Barrel holder	25	Snap ring	41	Lubrication port plate
10	Swash plate	26	Snap ring	42	Orifice
11	Thrust bush	27	Snap ring	43	Rivet
12	Seal holder	28	O-ring	44	Orifice
13	Gasket	29	O-ring	45	Pin
14	Spring C	30	O-ring	46	O-ring
15	Spring S	31	Backup ring	47	Plug
16	Control piston	32	Pin		

List of Sealing Parts (Kit Model Number PSBS-102220)

Part No.	Part Name	Q'ty	PVS-2B-45N3	
			Size	Remarks
13	Gasket	1	PS46-102000-0A	Nihon Gasket
24	Oil seal	1	TCN-305011-V	N.O.K
28	O-ring	1	1B-G70	JIS B 2401
29	O-ring	1	1B-P14	JIS B 2401
30	O-ring	1	1B-P11	JIS B 2401
46	O-ring	2	1B-P5	JIS B 2401
31	Backup ring	1	T2-P11	JIS B 2407

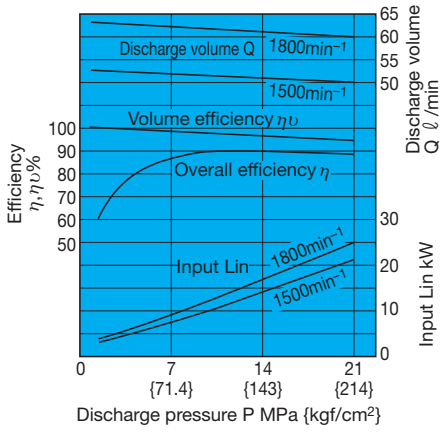
Parts marked by an asterisk *** are not available on the market. Consult your agent.

Performance Curves

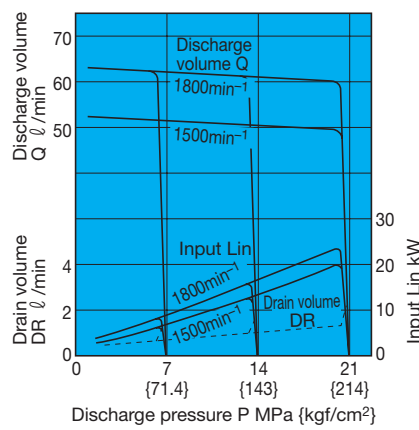
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-2B-35N*(Z)-12

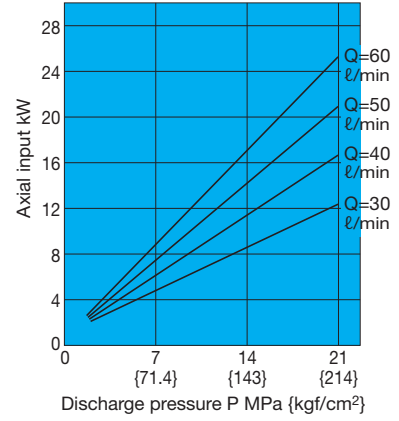
General Performance



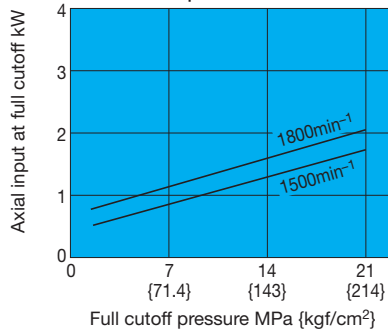
Pressure - Discharge Volume Characteristics



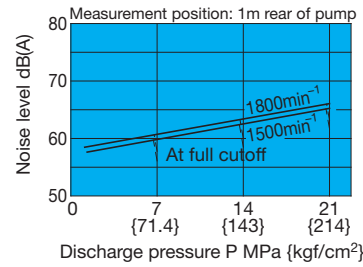
Axial Input



Axial Input at Full Cutoff



Noise Characteristics

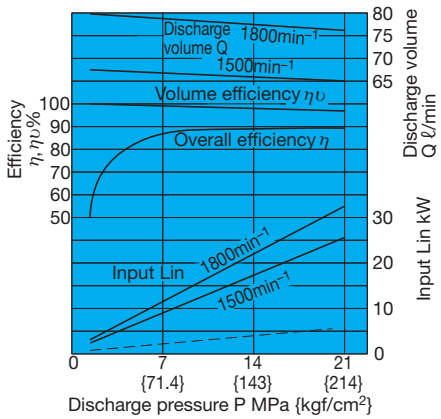


Performance Curves

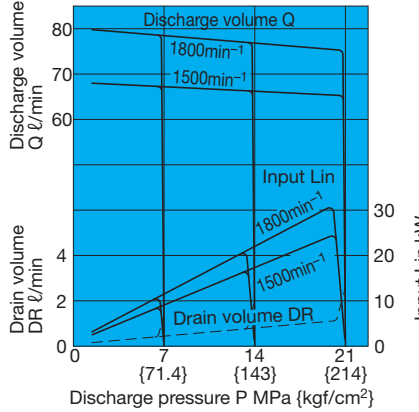
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

PVS-2B-45N*(Z)-12(20)

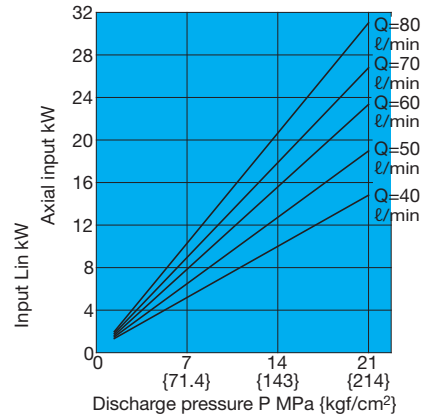
General Performance



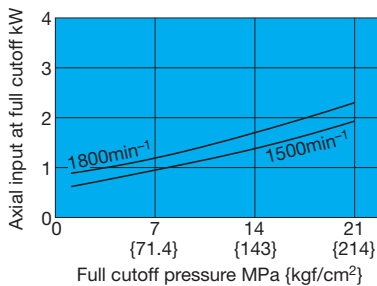
Pressure - Discharge Volume Characteristics



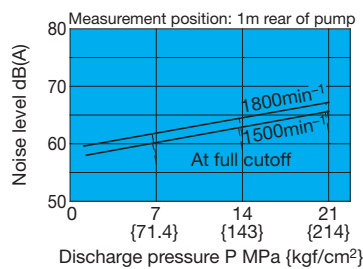
Axial Input



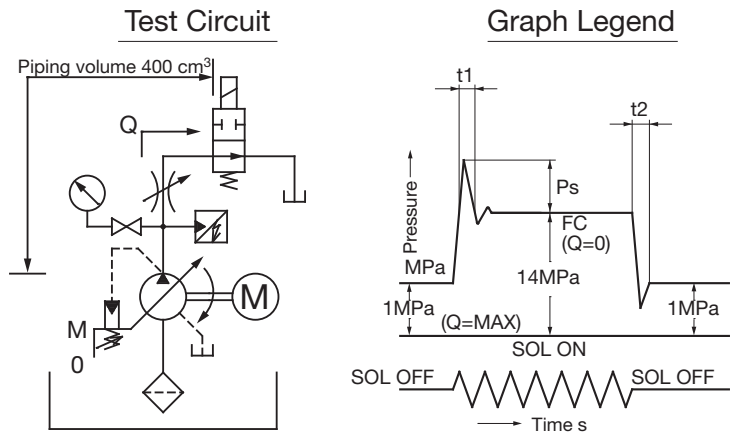
Axial Input at Full Cutoff



Noise Characteristics



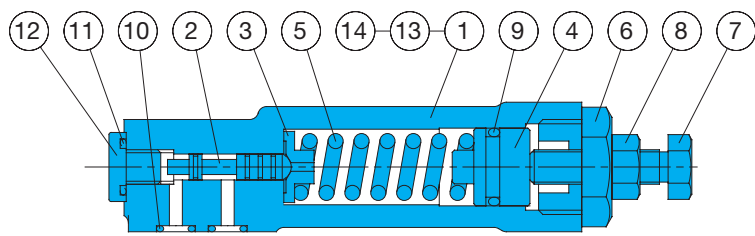
Response Performance



Model No.	Response Time (s)		Surge Pressure MPa{kgf/cm²}
	t ₁	t ₂	P _s
PVS-0B-8	0.03 to 0.04	0.04 to 0.06	2 to 4{20.4 to 40.8}
PVS-1B-16	0.05 to 0.06	0.07 to 0.08	4 to 7{40.8 to 71.4}
PVS-1B-22	0.05 to 0.06	0.07 to 0.08	5 to 8{51 to 81.6}
PVS-2B-35	0.05 to 0.06	0.05 to 0.07	6 to 9{61.2 to 91.8}
PVS-2B-45	0.05 to 0.06	0.05 to 0.07	6 to 9{61.2 to 91.8}

Response performance changes according to pipe volume and size.
Use an anti-surfing valve to prevent surge voltage.

Pressure Compensator



Part No.	Part Name	Part No.	Part Name
1	Body	8	Nut
2	Spool	9	O-ring
3	Holder	10	O-ring
4	Plunger	11	O-ring
5	Spring	12	Plug
6	Retainer	13	Plug
7	Pressure adjusting bolt	14	Mounting bolt

List of Sealing Parts

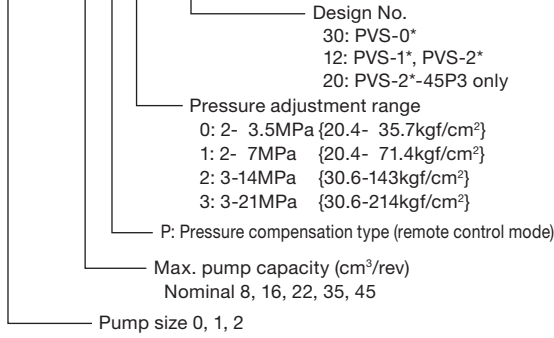
Part No.	Name	Q'ty	Size
			For 0B, 1B, 2B
9	O-ring	1	NBR-70-1 P14
10	O-ring	3	NBR-90 P6
11	O-ring	1	NBR-90 P10

Note) The materials and hardness of the O-ring conform with JIS B2401.

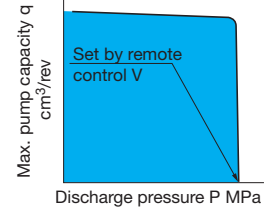
Pressure Compensation Type

(remote control mode)

Explanation of model No.: **PVS - 0 B - 8 P * - 30**



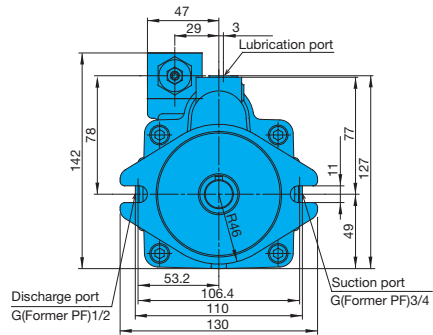
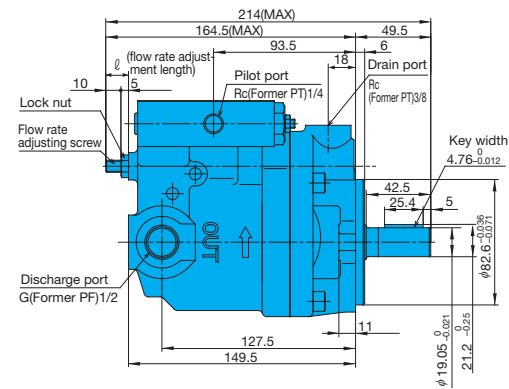
P-Q Characteristics



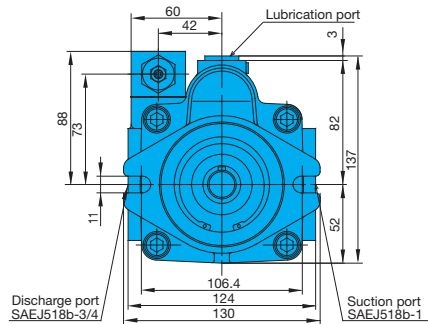
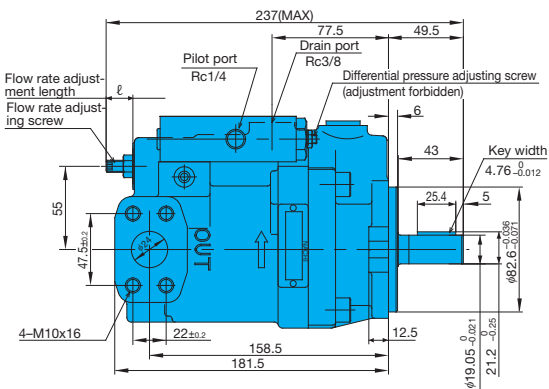
Installation Dimension Drawings

The ZR-T02-*5895* is the recommended remote control valve. Provide piping to the remote control valve at a pipe volume of 150 cm³ or less.

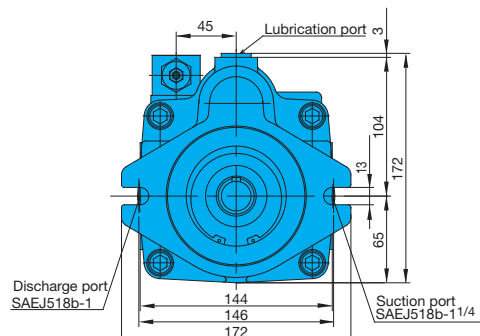
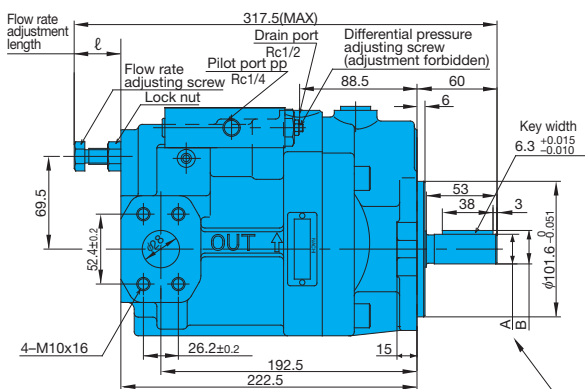
PVS-0B-8P*-30



PVS-1B-¹⁶/₂₂P*-12



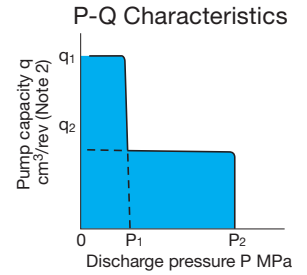
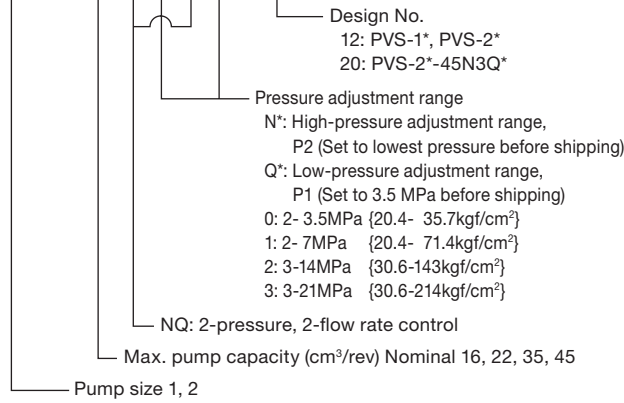
PVS-2B-³⁵/₄₅P*-12(20)



cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3 0 to 2	12D	φ22.23 ⁰ _{-0.021}	24.9 ⁰ _{-0.5}
45	3	20D	φ25.385 ⁰ _{-0.025}	27.85 ⁰ _{-0.25}

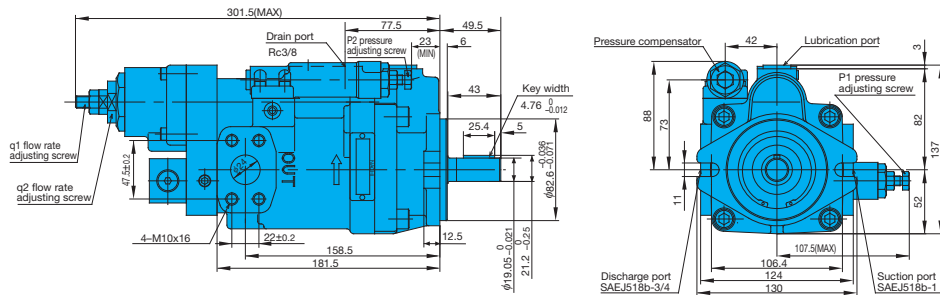
2-pressure, 2-flow Rate Control Type

Explanation of model No.: **PVS - 1 B - 16 N 3 Q 1 - 12**

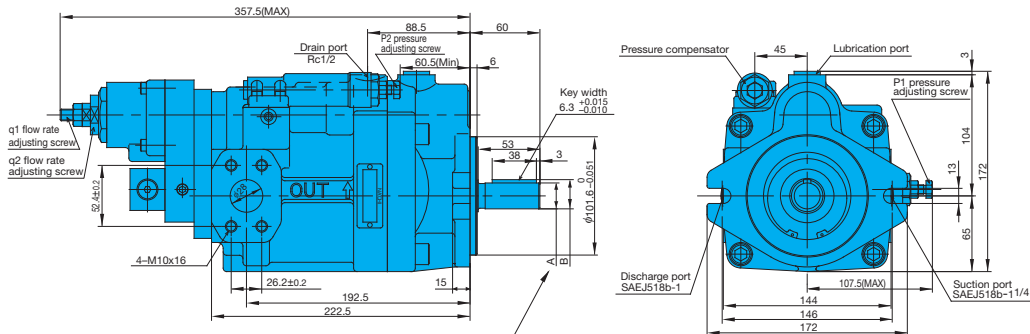


Installation Dimension Drawings

PVS-1B-¹⁶/₂₂N*Q*-12

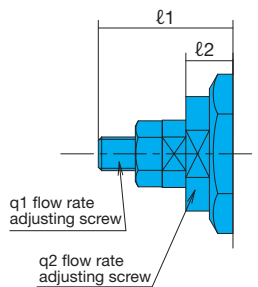


PVS-2B-³⁵/₄₅N*Q*-12(20)

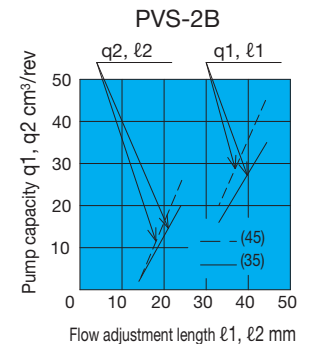
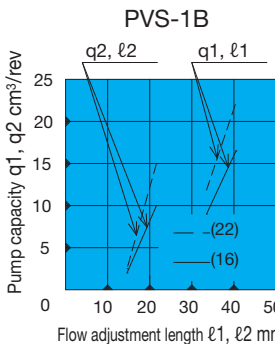


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 ⁰ _{-0.021}	24.9 ⁰ _{-0.5}
45	0 to 2	20D	φ25.385 ⁰ _{-0.025}	27.85 ⁰ _{-0.25}

Pump Model No.	q ₂ Adjustment Range (cm ³ /rev)	Default q ₂ (Setting cm ³ /rev)
PVS-1B-16	2 to 10	3.3
PVS-1B-22	2 to 13	4.4
PVS-2B-35	2 to 19	7
PVS-2B-45	3 to 24	9



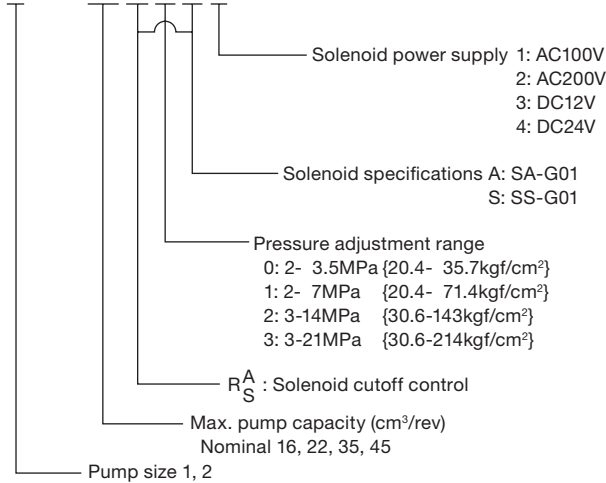
Flow adjustment length and pump capacity



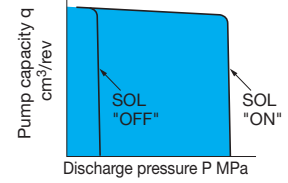
Note 1) The setting range of maximum pump capacity q₁ varies according to the setting of q₂.
 Note 2) Overall efficiency at a low flow rate is lower than at the maximum flow rate. Pay attention to this when selecting the motor capacity for the drive.

Solenoid Cutoff Control Type

Explanation of model No.: PVS - 1 B - 16 R 2 S 1 - 12

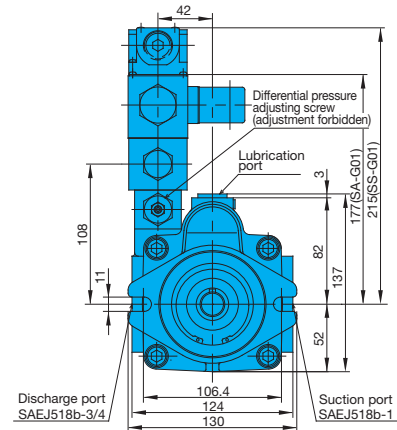
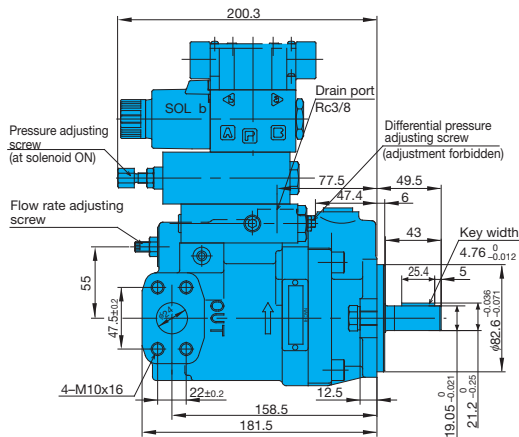


P-Q Characteristics

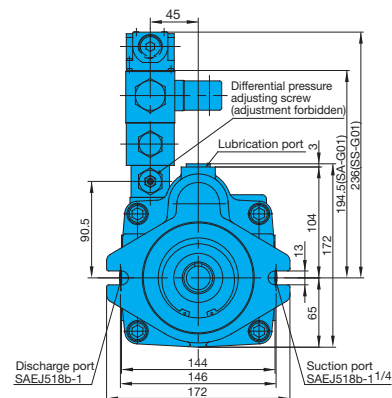
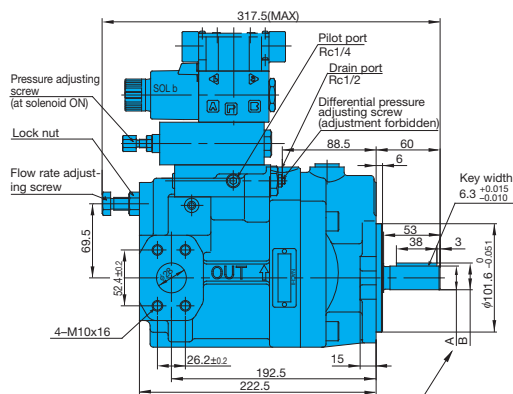


Installation Dimension Drawings

PVS-1B-16R^A_S-12



PVS-2B-35R^A_S-12(20)

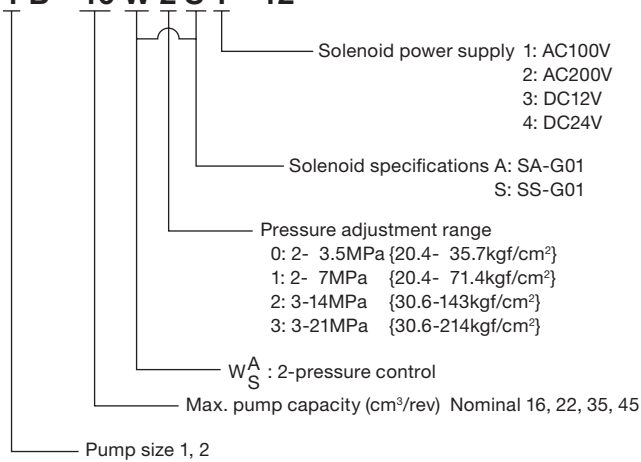


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	Ø22.23 ⁰ _{-0.021}	24.9 ⁰ _{-0.5}
45	0 to 2	3	Ø25.385 ⁰ _{-0.025}	27.85 ⁰ _{-0.25}

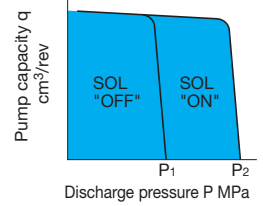
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

2-pressure Control Type

Explanation of model No.: **PVS - 1 B - 16 W 2 S 1 - 12**

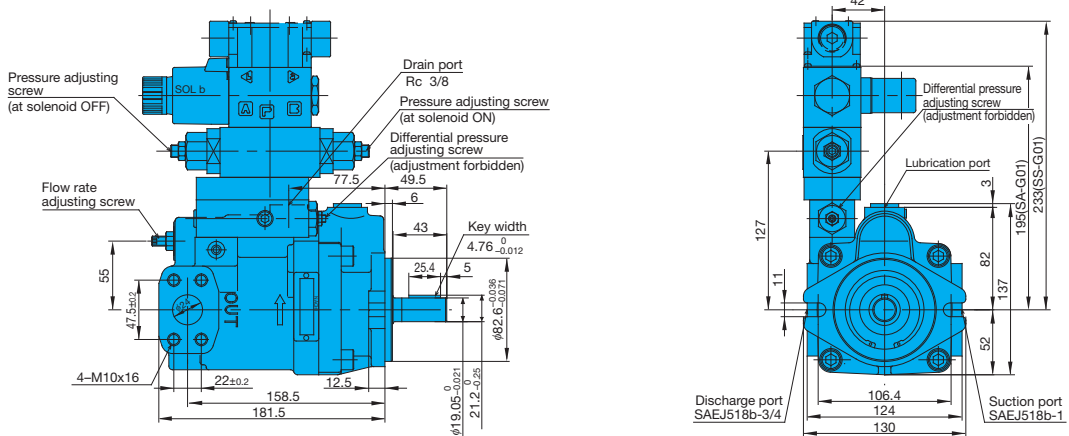


P-Q Characteristics

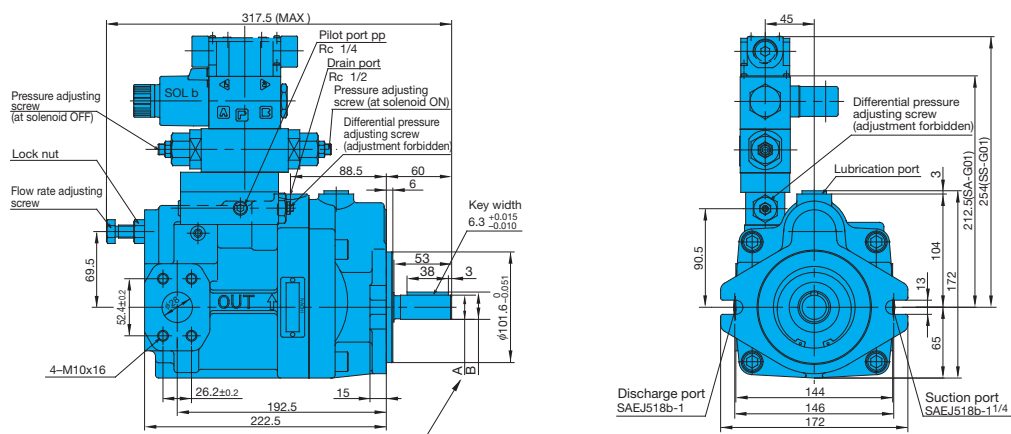


Installation Dimension Drawings

PVS-1B-¹⁶₂₂W^A_S-12



PVS-2B-³⁵₄₅W^A_S-12(20)

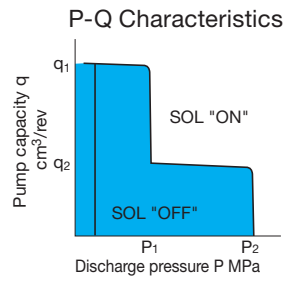
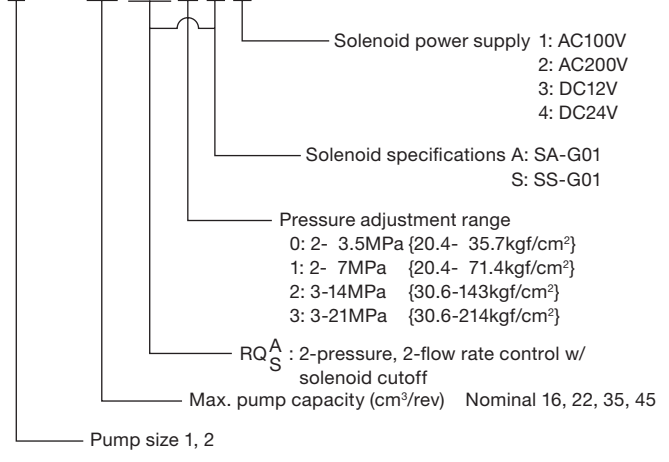


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	∅22.23 ⁰ _{-0.021}	24.9 ⁰ _{-0.15}
45	0 to 2	3	∅25.385 ⁰ _{-0.025}	27.85 ⁰ _{-0.25}

- The coil surface temperature increases if this pump is kept continuously energized. Do not touch the surface of the coil directly with your hands.

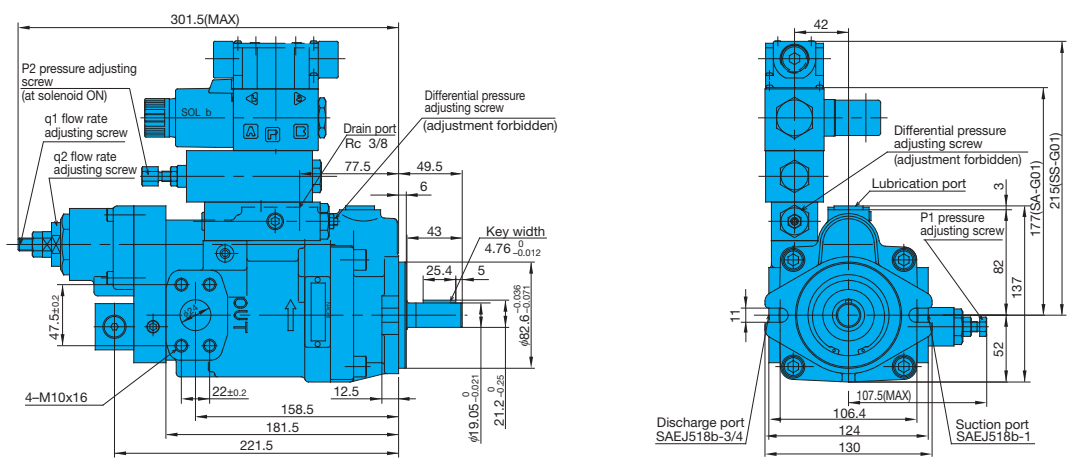
2-pressure, 2-flow rate Control Type w/ Solenoid Cutoff

Explanation of model No.: **PVS - 1 B - 16 RQ 2 S 1 - 12**

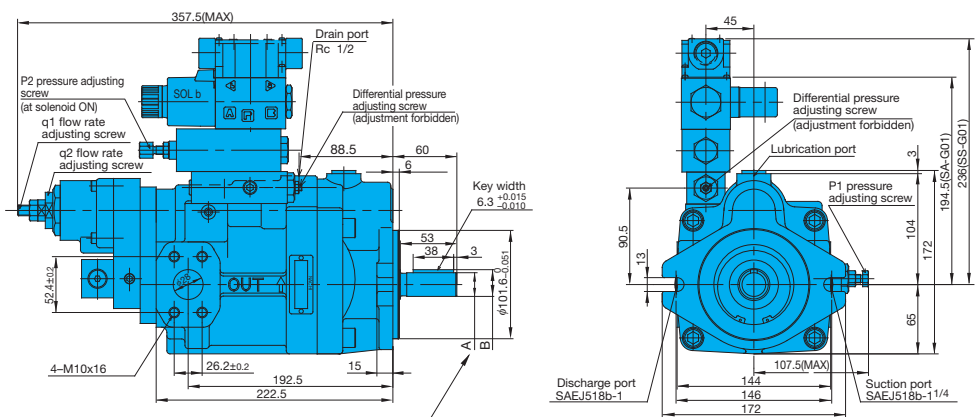


Installation Dimension Drawings

PVS-1B-¹⁶/₂₂RQ^A_S-12



PVS-2B-³⁵/₄₅RQ^A_S-12(20)

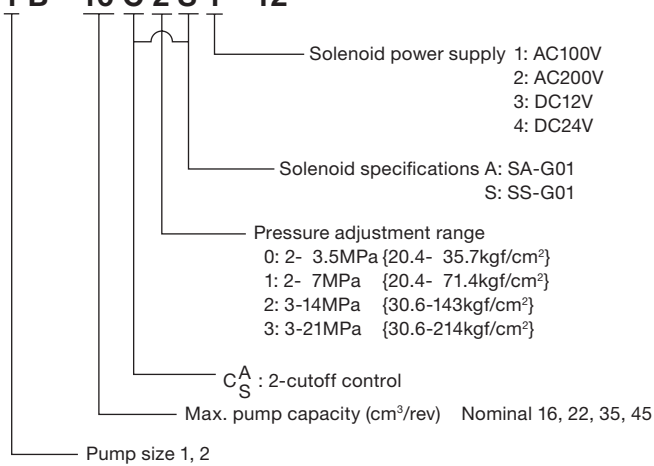


cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	φ22.23 ⁰ _{-0.021}	24.9 ⁰ _{-0.5}
45	0 to 2	3	φ25.385 ⁰ _{-0.025}	27.85 ⁰ _{-0.25}

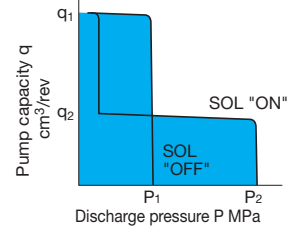
■ The coil surface temperature increases if this pump is kept continuously energized.
Do not touch the surface of the coil directly with your hands.

2-cutoff Control Type

Explanation of model No.: **PVS - 1 B - 16 C 2 S 1 - 12**

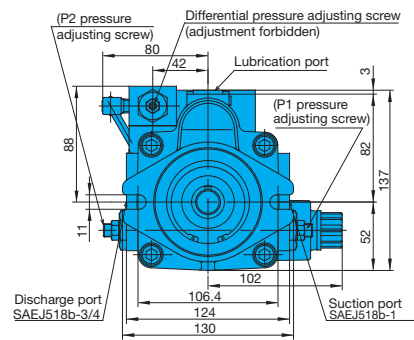
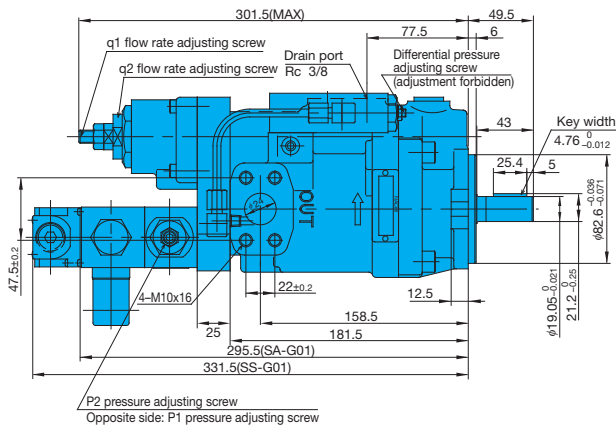


P-Q Characteristics

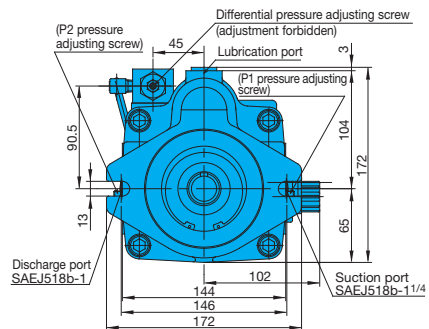
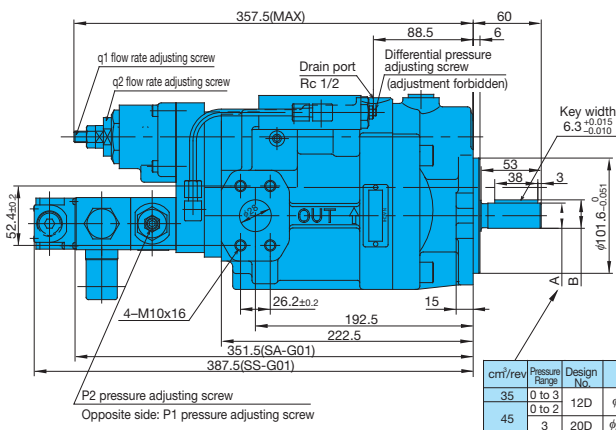


Installation Dimension Drawings

PVS-1B-¹⁶/₂₂C^A*S⁻¹²



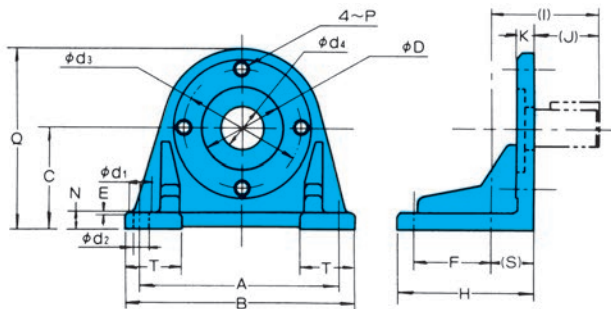
PVS-2B-³⁵/₄₅C^A*S⁻¹²⁽²⁰⁾



cm ³ /rev	Pressure Range	Design No.	A	B
35	0 to 3	12D	22.23 ⁰ / _{-0.021}	24.9 ⁰ / _{-0.5}
45	0 to 2	3	25.385 ⁰ / _{-0.025}	27.85 ⁰ / _{-0.25}

- The coil surface temperature increases if this pump is kept continuously energized. Do not touch the surface of the coil directly with your hands.

Foot Mounting Kit



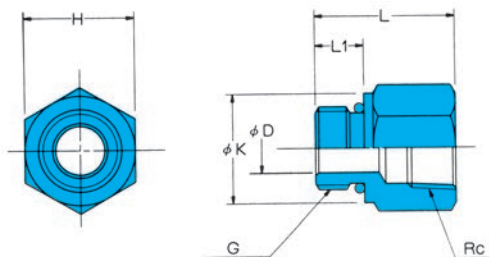
Kit Model No.	Applicable Pump Model No.	Accessories				Dimensions				
		Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F
IHM-2-10	PVS-0B PVS-1B	TB-10×30	2	WP-10	2	127	152.5	69.8	1	50.8
IHM-4-10	PVS-2B	TB-12×30	2	WP-12	2	220.7	246	107.95	1	114.3

Kit Model No.	Dimensions														Weight kg
	H	(I)	(J)	K	N	P	Q	(S)	T	φD	φd ₁	φd ₂	φd ₃	φd ₄	
IHM-2-10	96	64.5	32	17.5	13	M10	135	32.5	36.5	82.6	22	11	106.4	50	2.0
IHM-4-10	140	56.7	44	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	5.5

When only the mounting feet are required, the pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit.

Coupling kit

Kit for PVS-0B: PSCF-100000

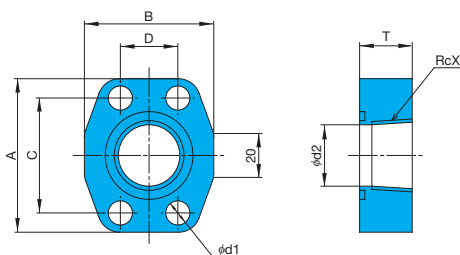


Applicable Pump Model No.	PVS-0B-8	
	Plunger Kit model No.	Port
	Suction port	Discharge port
L	46	40
L ₁	16	14
φK	φ36	φ27
φD	φ16	φ12
H	36	27
G screw size	G $\frac{3}{4}$	G $\frac{1}{2}$
Rc screw size	Rc $\frac{3}{4}$	Rc $\frac{1}{2}$
O-ring size	1B-P24	1B-P18

- Notes) 1. Joints are on sale in the Joint Kit which includes O-rings.
 2. The dimensions of the O-ring seal section on the connector conforms with JIS B2351.
 3. O-ring 1B/B-** refers to JIS B2401-1B.

Piping Flange Kit

For PVS-1B, 2B



Applicable Pump Model No.	PVS-1B-16, 22		PVS-2B-35, 45	
	PSF-101000		PSF-102000	
Plunger Kit model No.	Suction port	Discharge port	Suction port	Discharge port
A	70	65	79	70
B	59	52	73	59
C	52.4	47.5	58.7	52.4
D	26.2	22.0	30.2	26.2
T	24	24	28	24
φd ₁	φ11	φ11	φ11	φ11
φd ₂	φ28	φ22	φ37	φ28
X	1	3/4	1-1/4	1
Mounting bolt	TH-10×40	TH-10×40	TH-10×45	TH-10×40
Washer	WS-B-10	WS-B-10	WS-B-10	WS-B-10
O-ring	NBR-90 G35	NBR-90 G30	NBR-90 G45	NBR-90 G35
Weight kga	0.6	0.5	0.75	0.6

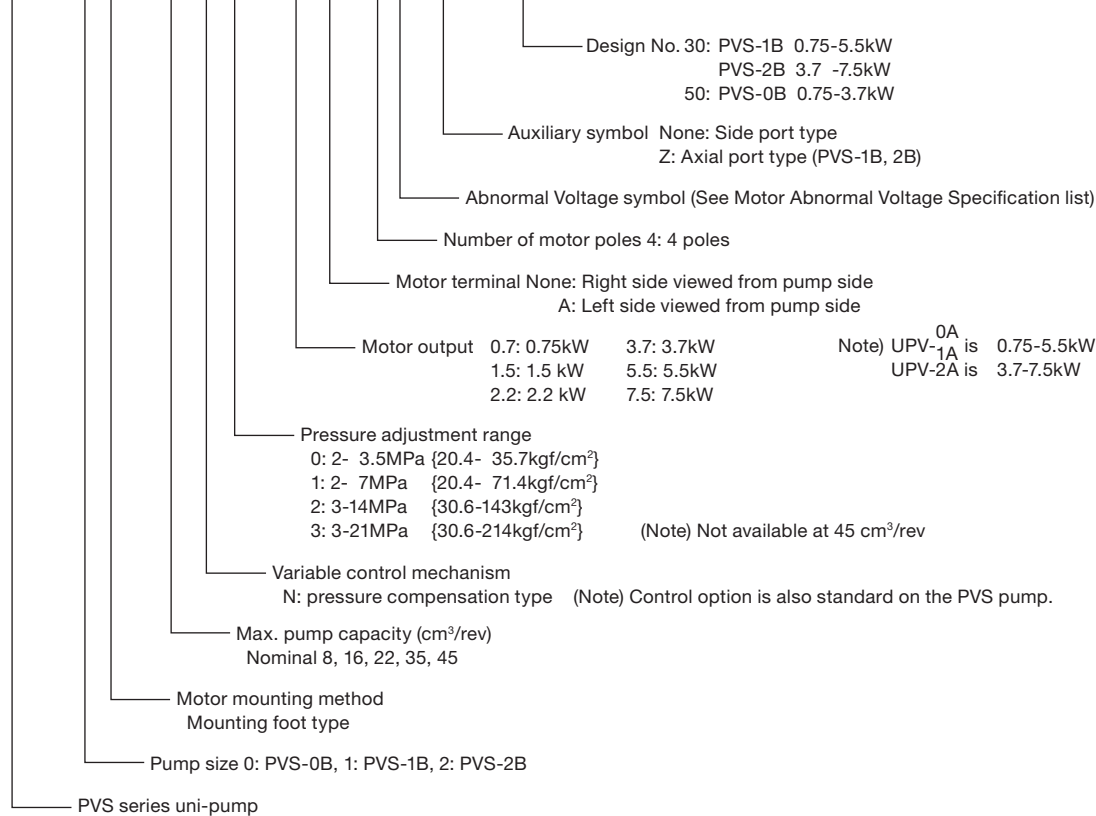
- Notes) 1. The piping flange is on sale in the Flange Kit which includes mounting bolts, washers and O-rings.
 2. The materials and hardness of the O-ring conform with JIS B2401
 3. For details on tightening torque, see page C-11.

Uni-pump Specifications

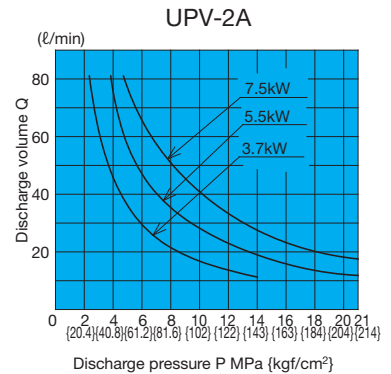
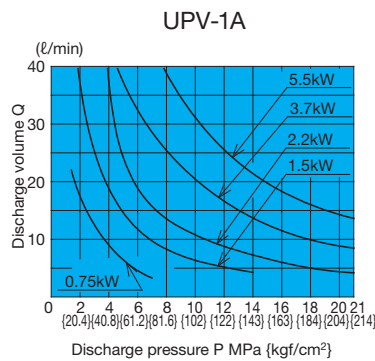
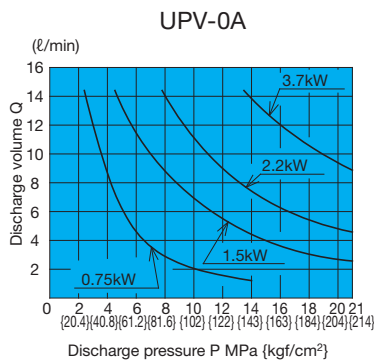
(CE mark standard compliant)

Explanation of model No.

UPV - 1 A - 16 N 1 - 1.5 * - 4 * - * - 30(50)



Motor selection curves



• How to select the motor

The lower side of the output curves for each of the motors shown above indicates the operating range under rated output for that motor.

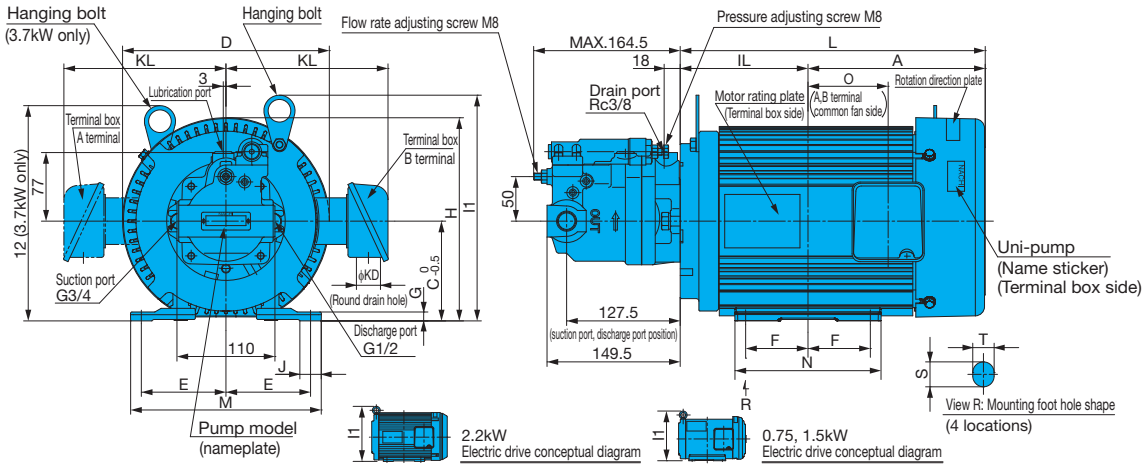
- * Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.
- * When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Motor Abnormal Voltage Specification list

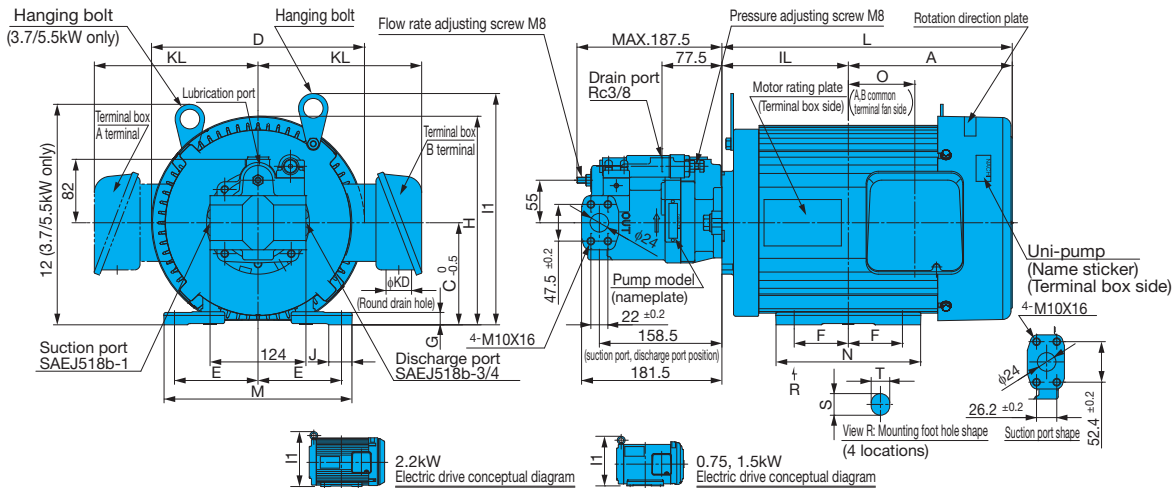
Abnormal Voltage symbol	Voltage - Frequency	Abnormal Voltage symbol	Voltage - Frequency
None	AC 200V-50/60Hz, AC 220V-60Hz	M	AC 230V - 60Hz
D	AC 380V - 50Hz	N	AC 230V - 50Hz
E	AC 415V - 50Hz	R	AC 400V - 50Hz
F	AC 440V - 60Hz	S	AC 440V - 50Hz
G	AC 460V - 60Hz	U	AC 380V - 60Hz
H	AC 480V - 60Hz	V	AC 400V - 60Hz
L	AC 220V - 50Hz	W	AC 420V - 50Hz

Installation Dimension Drawings

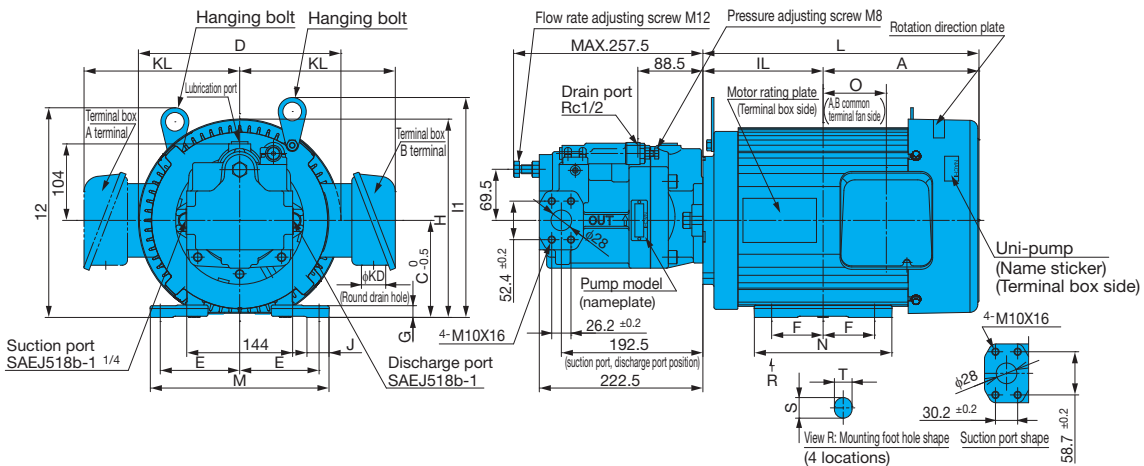
UPV-0A-8**-**-4-50
(side port type)



UPV-1A-16**-**-4-30
(side port type)



UPV-2A-35**-**-4-30
(side port type)



1. Drive motor is fully enclosed fan cooled, 0.75 to 3.7 kW is E type, and 5.5 to 7.5 kW is B type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Viewed from the pump side, suction port is on the left and discharge port is on the right.
4. Broken lines indicate instances for the A terminal. Broken lines pass through to the other side of the pump along its center.
5. See page (A-21) for the dimension table and characteristics of drive motor.

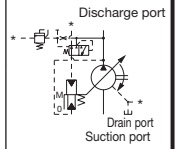
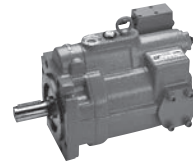
Motor Specifications

Output kW	Motor Dimensions [mm]																	Frame No.	Weight [kg]	
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL			O
0.75	137	107.5	80	152	62.5	50	4.5	160	193	–	47.5	244.5	165	130	25×10	27	137	65	80M	19
1.5	160.5	118.5	90	183	70	62.5	4.4	183	204	–	22	279	165	152.5	16×10	27	142	68	90L	22
2.2	179	133	100	206	80	70	7	203	226	–	39	312	206	170	14×12	27	153	83	100L	36
3.7	199	143.5	112	233	95	70	10	228	253	242	24	342.5	214	164	14×12	27	182	90	112M	40
5.5	212	163.5	132	275	108	70	16	270	299	285	30	375.5	243	187	14×12	33	212	86	132S	52
7.5	231	182.5	132	275	108	89	16	269	299	285	30	413.5	243	226	14×12	33	212	105	132M	60

Characteristics of drive motor for unipump (domestic standard 3 rating)

Output kW	Poles	(Note1). Model Number TYPE (N)	Voltage [V]	Frequency [Hz]	Current rating [A]	RPM rating [min ⁻¹]	Heat resistance
0.4	4	VBEA- (VDS series only)	200	50	2.20	1420	E
			200	60	1.90	1710	
			220	60	1.91	1720	
0.75	4	V*EA-*A4*07	200	50	3.5	1430	F
			200	60	3.2	1720	
			220	60	3.1	1730	
1.5	4	V*EA-*A4*15	200	50	6.9	1450	F
			200	60	6.2	1740	
			220	60	6.0	1750	
2.2	4	V*EA-*A4*22	200	50	9.5	1460	F
			200	60	8.8	1750	
			220	60	8.5	1760	
3.7	4	V*EA-*A4*37	200	50	15.4	1460	F
			200	60	14.3	1760	
			220	60	13.5	1760	
5.5	4	V*EA-*A4*55	200	50	23.0	1470	F
			200	60	21.0	1760	
			220	60	19.9	1770	
7.5	4	V*EA-*A4*75	200	50	30.0	1460	F
			200	60	27.0	1760	
			220	60	26.0	1770	

1. The asterisks * indicate variations in the hydraulic pump series, size, and position of terminal box. Check the ratings sticker on the side of the drive motor (terminal box side).
2. Contact us for variations in voltage.
3. The allowable fluctuating range of the voltage value is ±5%.
4. Paint Color: Nachi standard color Mancel No. 5B6/3



PZS Series Variable Volume Piston Pump

70 to 220cm³/rev
70 to 100cm³/rev 28MPa
130 to 220cm³/rev 25MPa

Features

- ① **High pressure, high reliability**
These pumps deliver the perfect combination of high pressure (28MPa {286kgf/cm²} maximum) and high reliability. Hydraulic device energy efficiency is ensured because variable volume capabilities provide the means to keep the discharge rate to the desired level.
- ② **Low noise, low vibration operation**
The semi-cylindrical swash plate of the PVS series provides high support and

rigidity, making it possible to increase the number of pistons (from nine to 11) and equip optimal valve plates, all of which make low-noise operation possible.

- ③ **High reliability, long life**
O-ring seals used for mating surfaces eliminate worries about oil leaks. A spherical valve plate maintains optimal hydraulic pressure balance, for stable operation across a wide range and better contamination resistance characteristics.

- ④ **A wide range of possible applications**
In addition to use as a stand-alone pump, a PVS Series pump can be combined with another IP pump in a wide range of possible applications.

Specifications

Model No.	Pump Capacity cm ³ /rev (Adjustment Range)	Rated Voltage MPa {kgf/cm ² }	Maximum Working Pressure MPa {kgf/cm ² }	Pressure Adjustment Range MPa {kgf/cm ² }	Revolution Speed min ⁻¹		Weight kg	Fixed Discharge Pump (Note 1)	
					Min.	Max.		Capacity cm ³ /rev	Pressure MPa {kgf/cm ² }
PZS-3B-170* 1-10 3 4	70 (45 to 70)	21 {214}	28 {286}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 28 {20.4 to 286 }	500	1800	37	3.6 to 15.8 (IPH-2.3 type)	21 {214}
PZS-4B-100* 1-10 3 4	100 (40 to 100)	21 {214}	28 {286}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 28 {20.4 to 286 }	500	1800	58	3.6 to 15.8 (IPH-2.3 type)	21 {214}
PZS-5B-130* 1-10 3 4	130 (51 to 130)	21 {214}	25 {255}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 25 {20.4 to 255 }	500	1800	86	3.6 to 32.3 (IPH-2.3.4 type)	21 {214}
PZS-6B-180* 1-10 3 4	180 (101 to 180)	21 {214}	25 {255}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 25 {20.4 to 255 }	500	1800	123	3.6 to 63.9 (IPH-2.3.4.5 type)	21 {214}
PZS-6B-220* 1-10 3 4	220 (124 to 220)	21 {214}	25 {255}	2 to 7 {20.4 to 71.4} 2 to 21 {20.4 to 214 } 2 to 25 {20.4 to 255 }	500	1500	126	3.6 to 63.9 (IPH-2.3.4.5 type)	21 {214}

Note 1. Fixed discharged pump of IP pump can be configured by combining with PZS.
2. Pump capacity adjustment ranges are for control codes N, RS, and WS. For information about control code NQ, see page A-27.
3. Direction of rotation is clockwise when viewed from the shaft end.

- **Handling**
- **Pump Installation and Piping Precautions**
 - ① Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent radial or thrust load from being applied to the pump shaft.
 - ② Eccentricity between the drive shaft and pump shaft should be no greater than 0.05mm, with an eccentric angle error of 1° or less.
 - ③ Keep the fitting length of couplings and pump shafts at least 2/3 the length of the coupling width.
 - ④ Use a sufficiently rigid pump mounting base.
 - ⑤ Set pump suction side pressure to -0.03 MPa or more (suction port flow velocity less than 2 m/sec).
 - ⑥ Raise part of the drain piping so it is above the topmost part of the pump body, and insert the return section of

the drain piping into the hydraulic operating fluid. Also, observe the values in the following table in order to limit the drain back pressure to 0.1 MPa.

Model No.	3B, 4B, 5B	6B
Item		
Pipe joint size	At least 3/4"	At least 1"
Pipe I.D.	At least φ17	At least φ22
Pipe length	1 m or less	1 m or less

- ⑦ Mount the pump so the pump shaft is oriented horizontally.
- ⑧ Use of rubber hose is recommended in order to minimize noise and vibration.
- ⑨ Check valve is located on the discharge side of the pump. (To prevent reverse rotation and damage to the pump when it is off)

- **Management of Hydraulic Operating Fluid**
 - ① Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 mm²/sec. Normally, you should use an R&O type and wear-resistant type of ISOGV32 to 68 or equivalent. The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.
 - ② The operating temperature range is 5 to 60°C. When the oil temperature at startup is 5°C or less, run the pump at low pressure and low speed until the oil temperature reaches 5°C.
 - ③ Provide a suction strainer with a filtering grade of about 100μ (150 mesh).
 - ④ Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.
- (Continued on following page)

⑤ Use hydraulic operating fluid when the operating ambient temperature is in the range of 0 to 60°C.

● Inverter Drive Precautions

- ① Set the revolution speed within the range of the pump specification revolution speed.
- ② Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

● Startup Precautions

① Before starting up the pump, fill the pump body with clean hydraulic operating fluid through the lubrication port.

Model No.	Oil Amount cm ³
PZS-3B	1000
PZS-4B	1800
PZS-5B	2200
PZS-6B	3000

② An unload circuit is required when the motor is started under condition $\lambda-\Delta$. Contact your agent about the unload circuit.

③ Check to make sure that the rotation direction of the pump is the same as the rotation direction indicated by the arrow on the pump body.

④ Air entering the pump or pipes can cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to remove any air that might be in the pump or pipes.

⑤ Equip an air bleed valve in circuits where it is difficult to release air before startup. (See "IP Pumps" on page C-13.)

⑥ Install a check valve on the discharge side to protect the pump if the load is large or if there is an accumulator in the circuit on the discharge side of the pump.

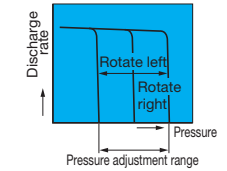
⑦ Do not release the pressure in the hydraulic circuit by switching the solenoid valve (RS/WS type) on the pump.

● Configuring Pressure and Discharge Rate Settings

The factory default pump discharge rate setting is the setting's maximum value, while the default discharge pressure is the settings minimum value. Change the discharge rate and discharge pressure settings in accordance with your particular operating conditions.

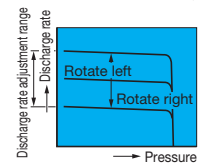
[Pressure Adjustment]

Rotating the pressure adjusting screw clockwise increases pressure.



[Discharge Volume Adjustment]

Rotating the flow rate adjusting screw clockwise decreases the discharge rate.



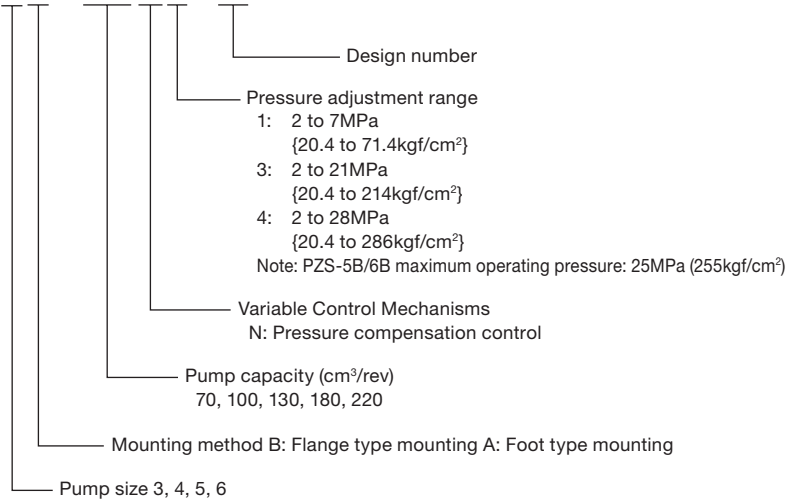
Note: Securely tighten the lock nut after making adjustments.

Explanation of model No.

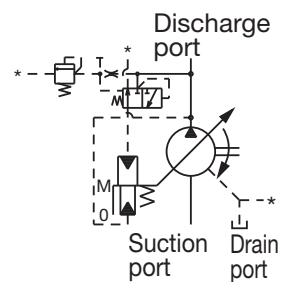
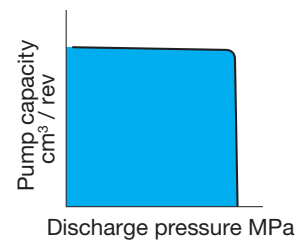
Standard type

Pressure compensation(N)

PZS - 4 B - 100 N * - 10



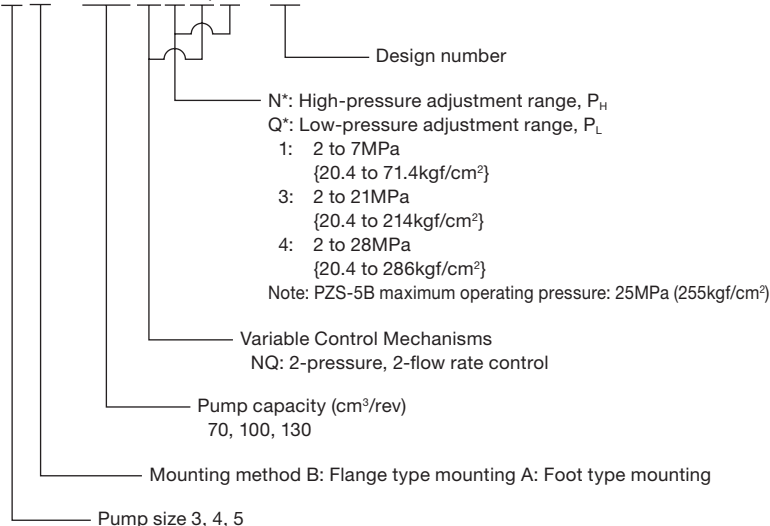
P-Q characteristics



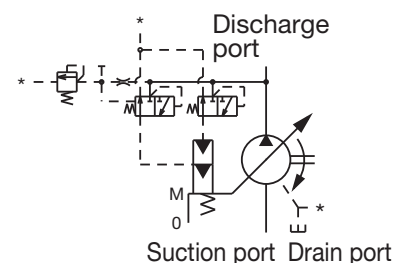
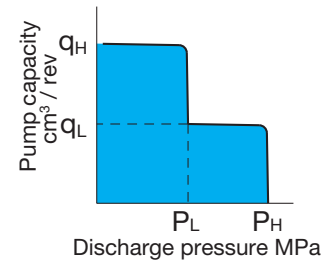
Option type

2-Pressure, 2-Flow Rate Control Type (NQ)

PZS - 4 B - 100 N * Q * - 10

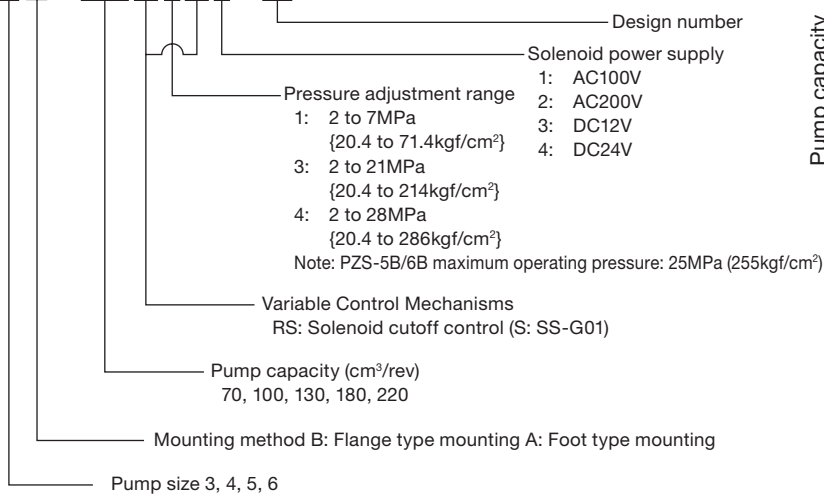


P-Q characteristics

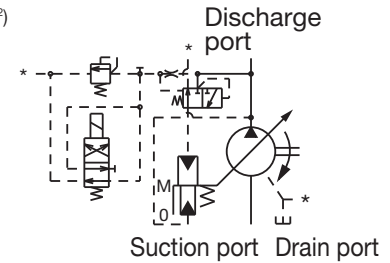
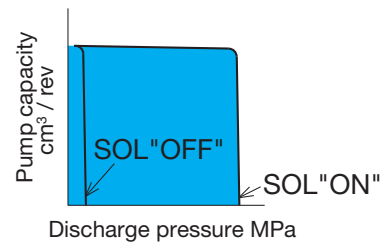


Solenoid Cutoff Control Type (WS)

PZS - 4 B - 100 R * S * - 10



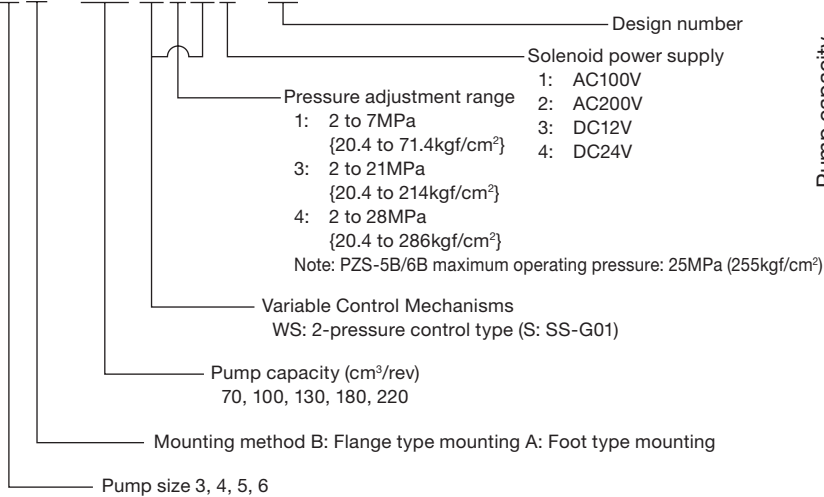
P-Q characteristics



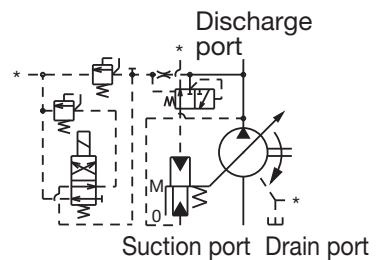
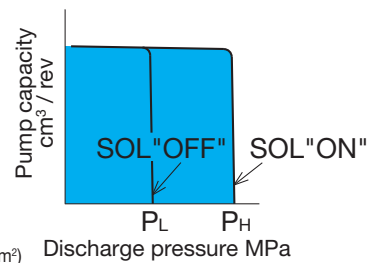
■ Do not use the solenoid valve to release the pressure in the hydraulic circuit.

2-Pressure Control System (WS)

PZS - 4 B - 100 W * S * - 10



P-Q characteristics

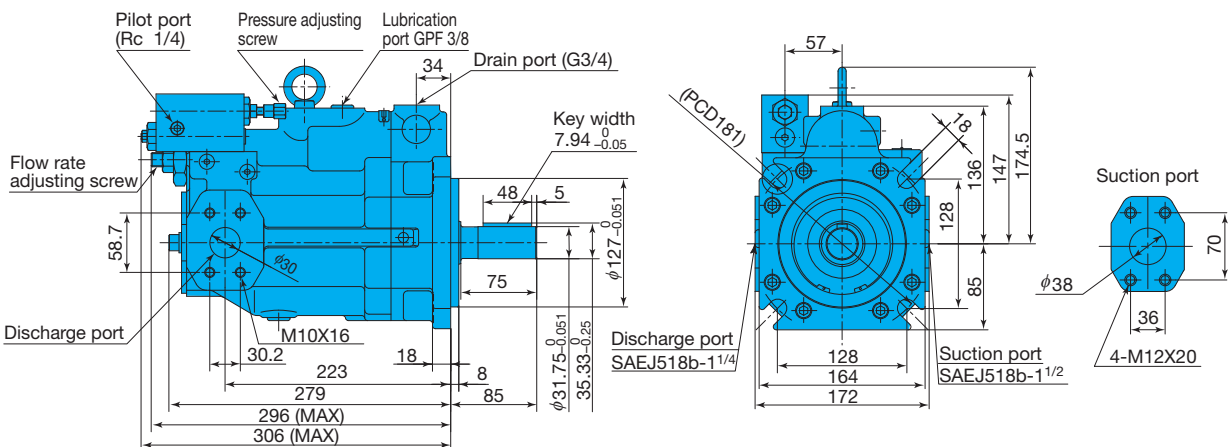


Installation Dimension Drawings

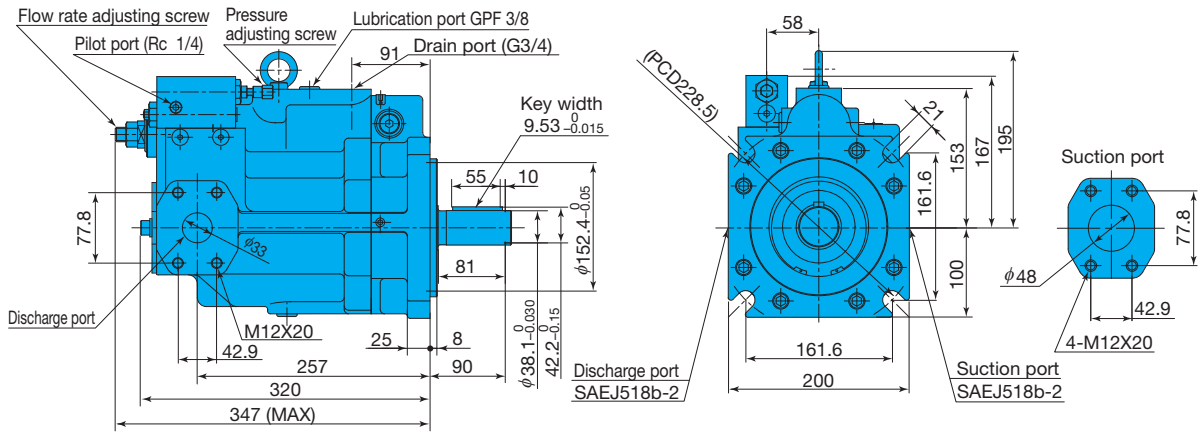
Pressure Compensation Type

Installing a remote control relieve valve to the pilot port provides remote control of pressure compensation. (PVS series "P type")

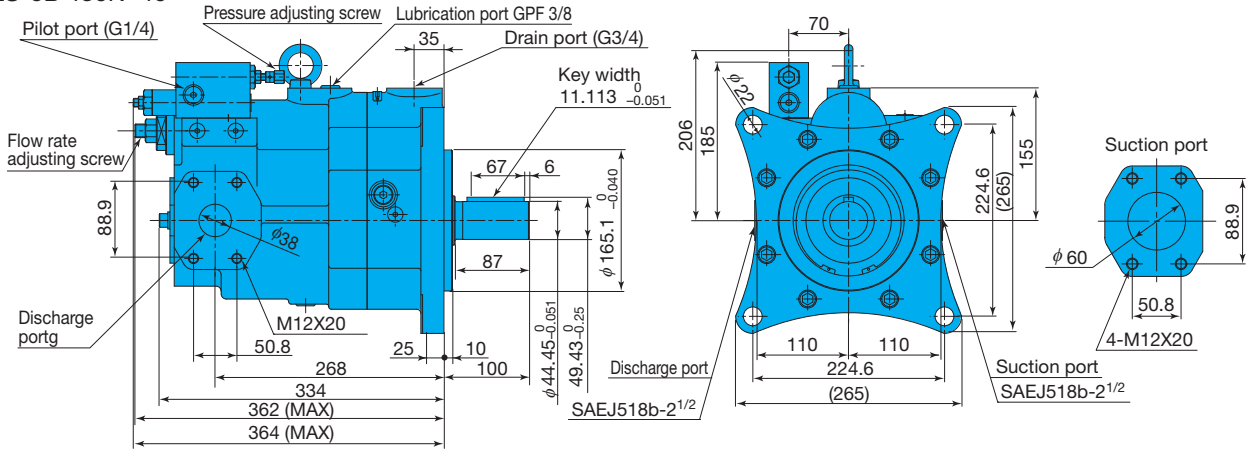
PZS-3B-70N*-10



PZS-4B-100N*-10

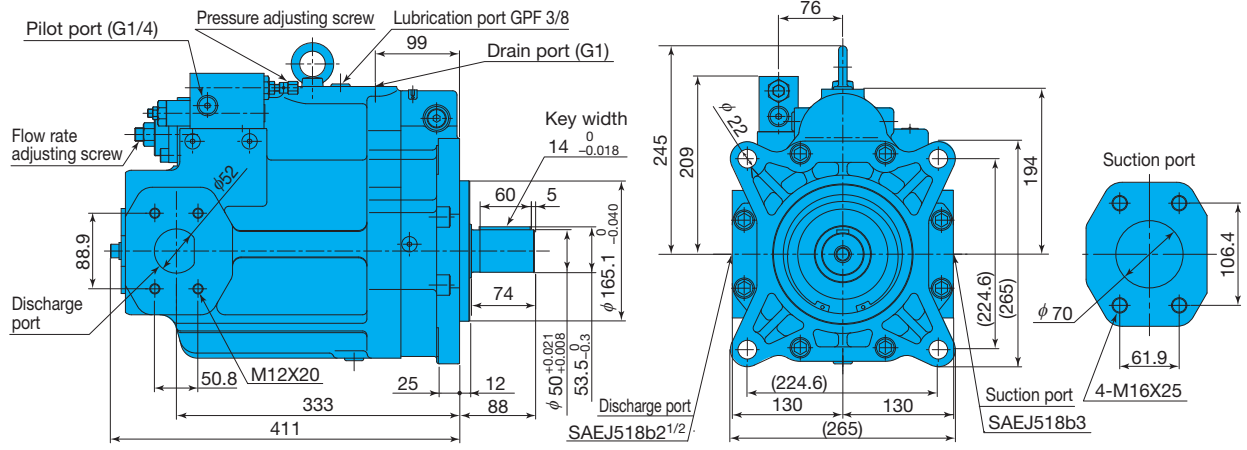


PZS-5B-130N*-10

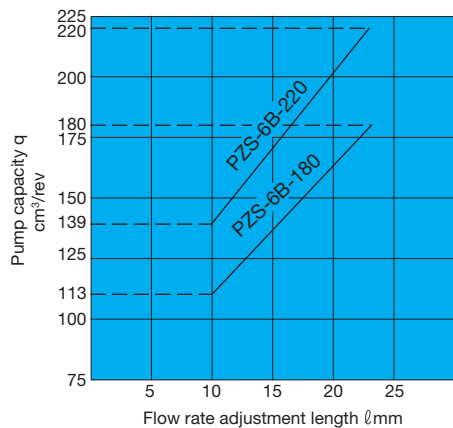
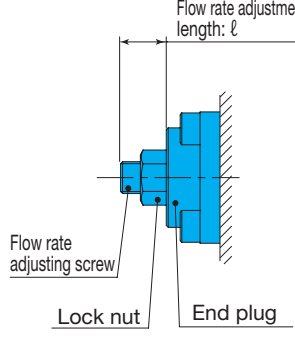
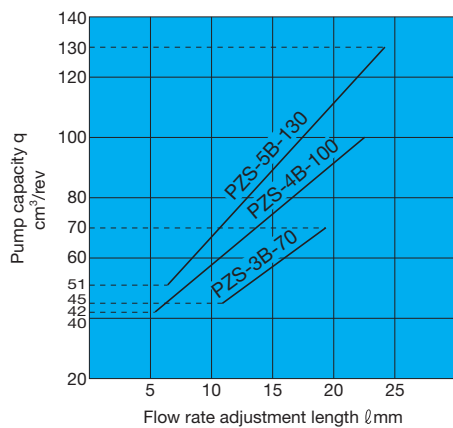


PZS-6B-180N*-10

PZS-6B-220N*-10



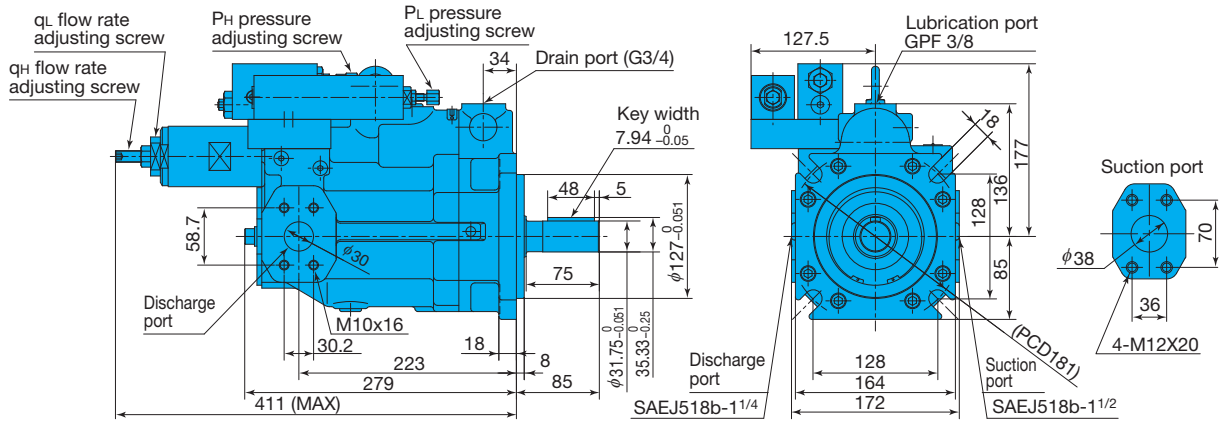
Flow Adjustment Rotation Angle (ℓ) and Pump Capacity (q)



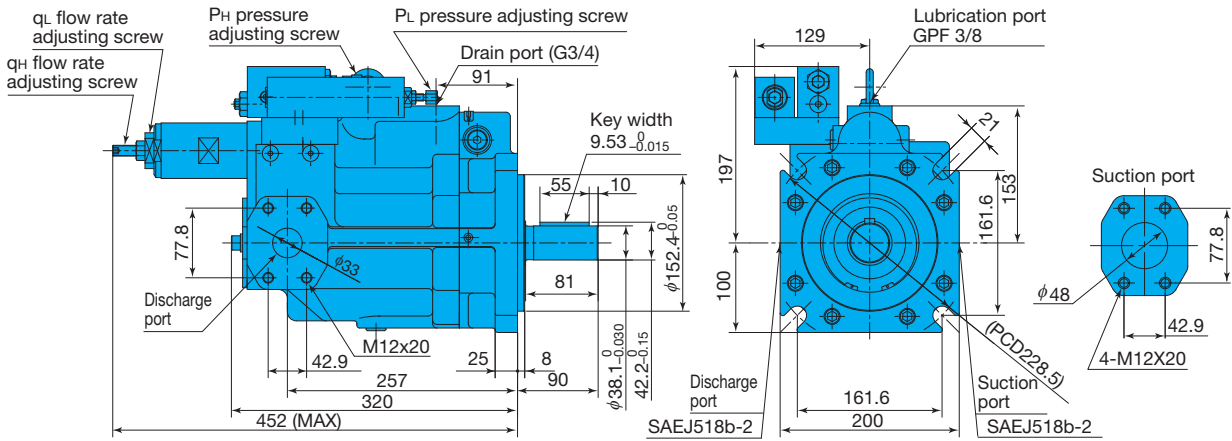
Use a flow adjustment length that is within the range noted in the above chart. Using a length that is outside the lower limit adjustment range can lead to oil leaks.

Use a flow adjustment length that is within the range noted in the above chart. Using a length that is outside the lower limit adjustment range can lead to oil leaks.

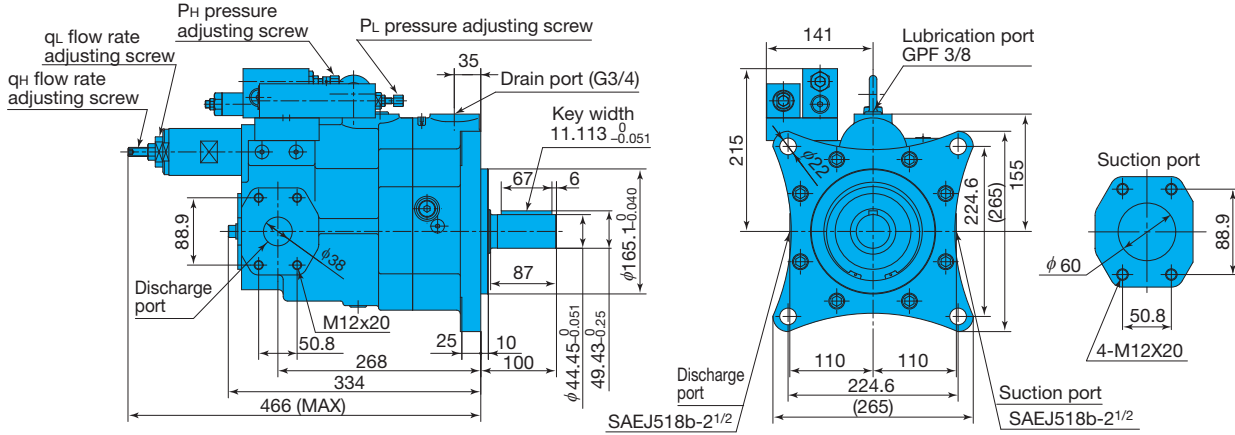
2-Pressure, 2-Flow Rate Control Type
PZS-3B-70N*Q*-10



PZS-4B-100N*Q*-10



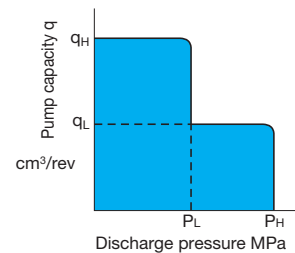
PZS-5B-130N*Q*-10



Pump Volume Adjustable Range

Pump Model No.	Volume Adjustment Range cm ³ /rev		Factory Default q _L Setting (cm ³ /rev)
	q _H Note 1	q _L Note 2	
PZS-3B- 70N*Q*-10	5 to 70	5 to 40	14
PZS-4B-100N*Q*-10	16 to 100	7 to 60	20
PZS-5B-130N*Q*-10	17 to 130	8 to 70	26

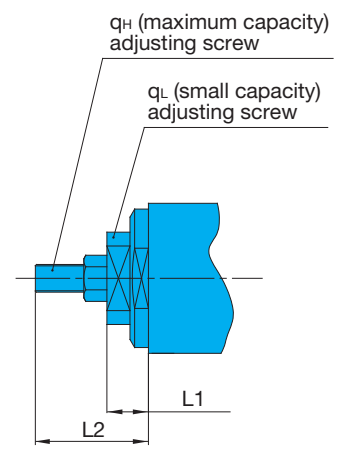
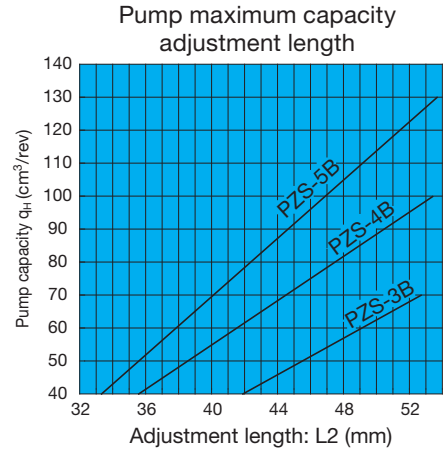
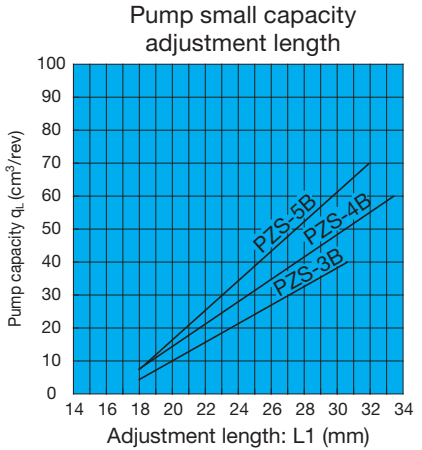
P-Q characteristics



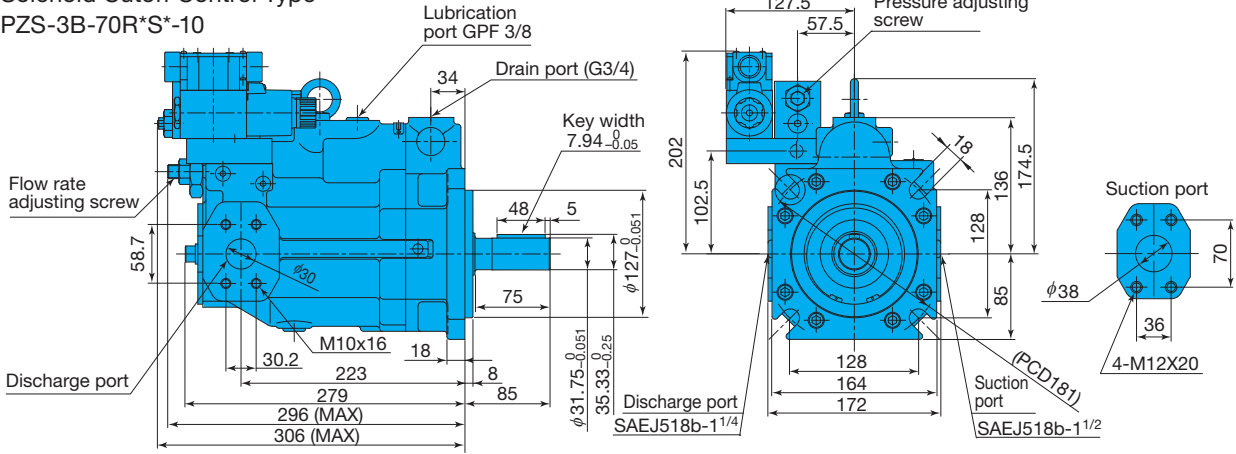
Note1: The setting range for pump maximum capacity q_H depends on the q_L setting.
 Note2: Overall efficiency at a low flow rate is lower than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.
 Note3: P_L is set to 3.5 MPa before shipping. (P_H is the lowest pressure)

PZS Pump 2-Pressure 2-Flow Rate Control Flow Rate Adjustment Graph

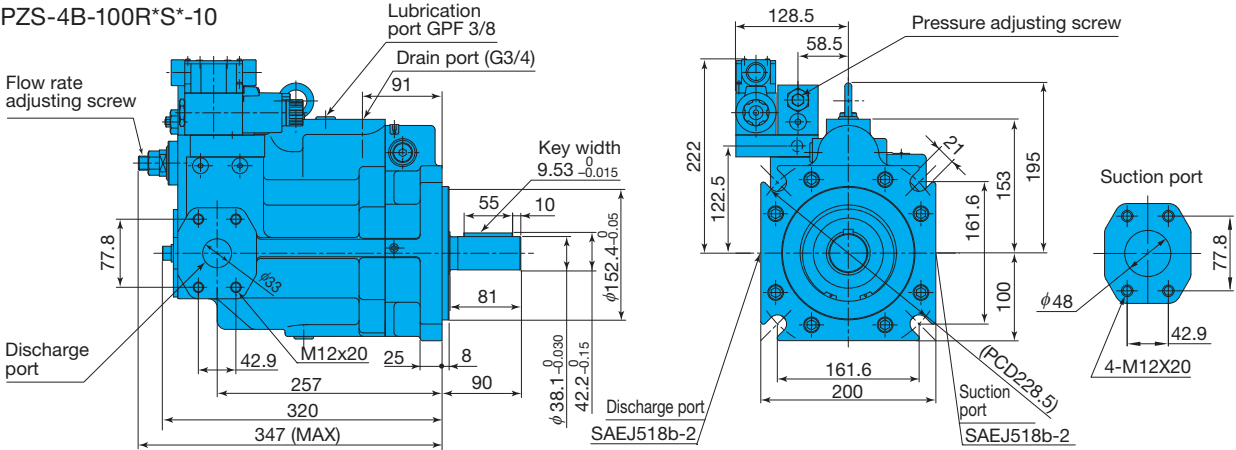
- Be sure to adjust the low flow rate first, and then adjust the maximum flow rate.
- Remember that the maximum flow rate adjustment range (lower limit) changes in accordance with the low flow rate adjustment. The maximum flow rate adjustment lower limit is equivalent to the low flow rate adjustment length (L1) plus 11mm.
- Pump efficiency at a low flow rate is worse than at the maximum flow rate. Keep this in mind when deciding on the drive motor capacity.



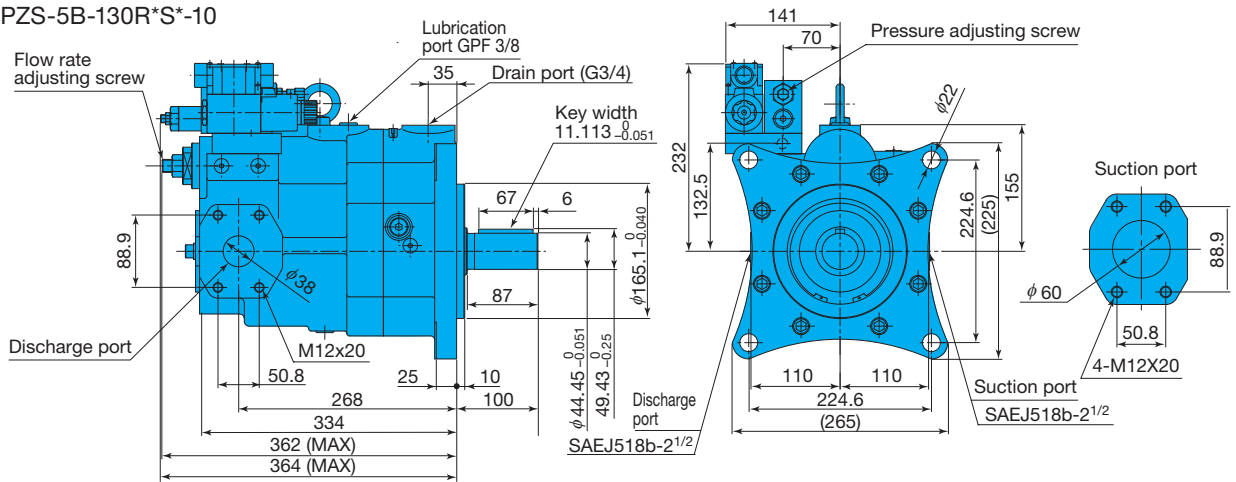
Solenoid Cutoff Control Type
PZS-3B-70R*S*-10



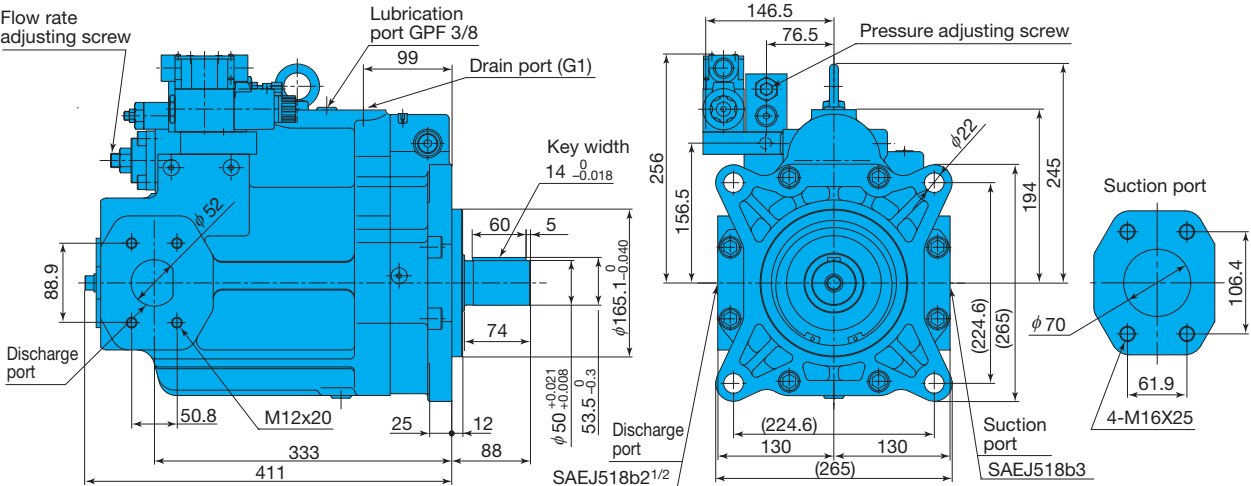
PZS-4B-100R*S*-10



PZS-5B-130R*S*-10

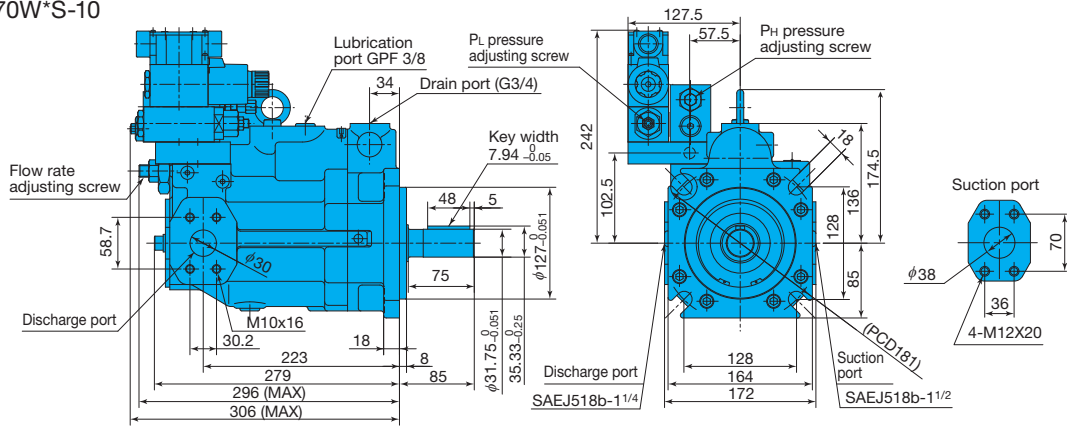


PZS-6B-180R*S*-10
PZS-6B-220R*S*-10

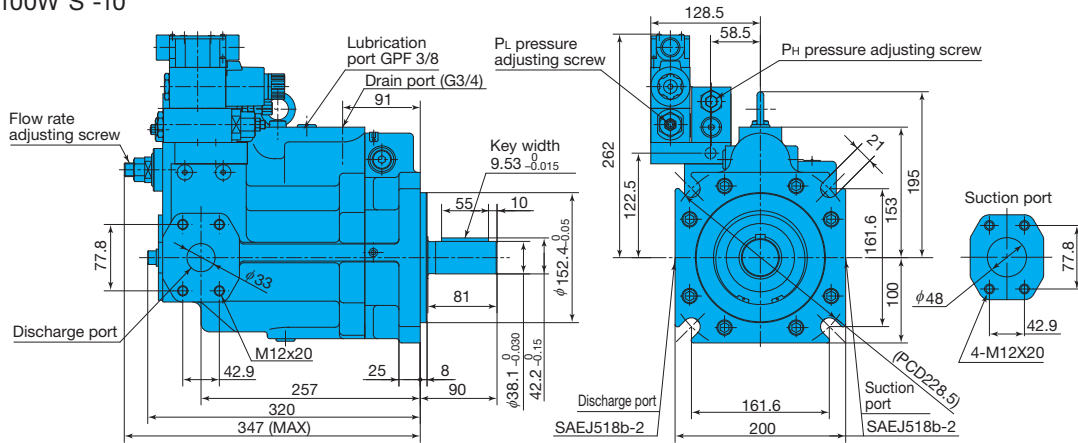


- Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot. Do not touch the surface of the coil directly with your hands.
- Do not use the solenoid valve to release the pressure in the hydraulic circuit.

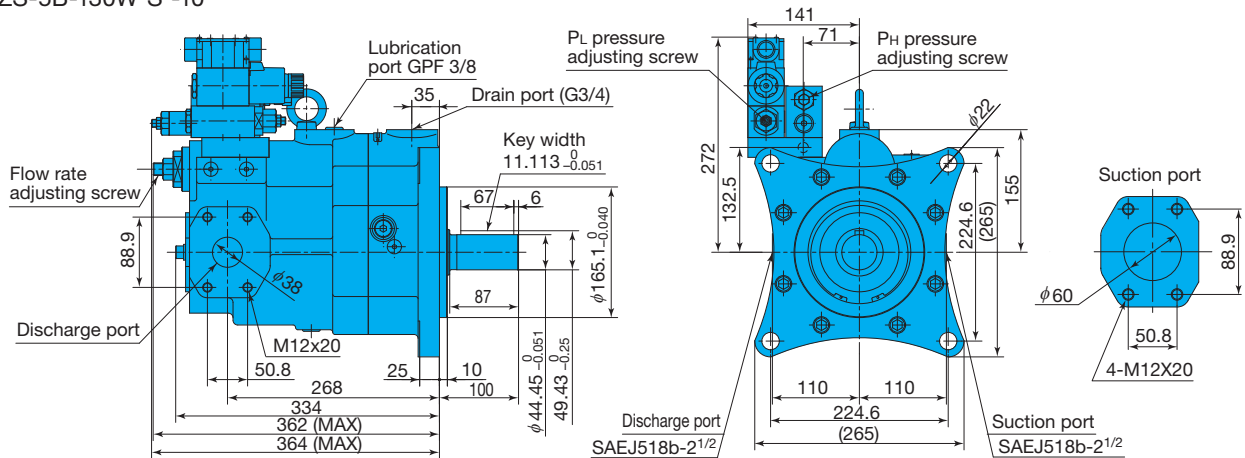
2-Pressure Control Type
PZS-3B-70W*S-10



PZS-4B-100W*S*-10

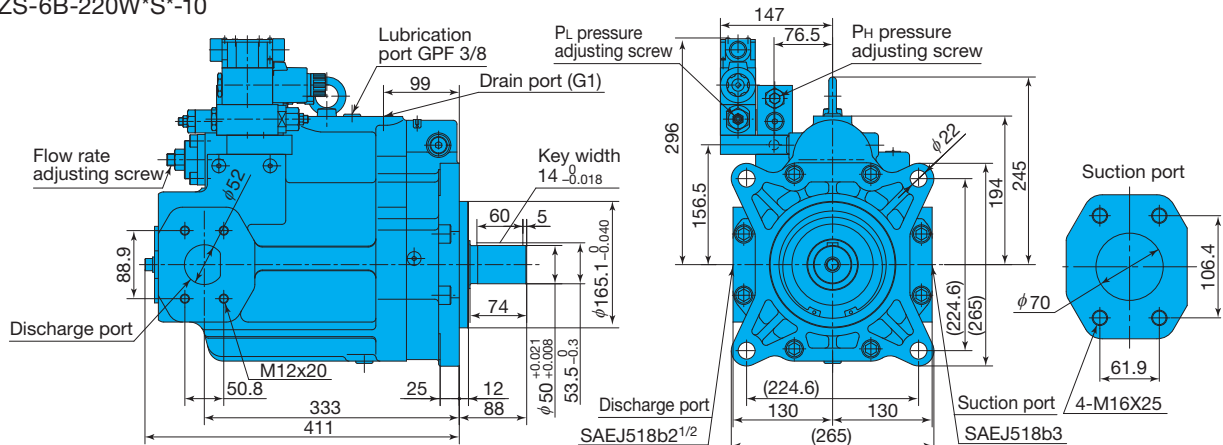


PZS-5B-130W*S*-10



PZS-6B-180W*S*-10

PZS-6B-220W*S*-10



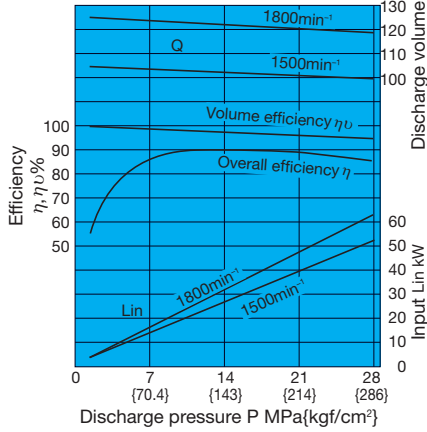
- Using the installed solenoid valve so it is continuously conducting current can cause the coil surface to become hot. Do not touch the surface of the coil directly with your hands.
- Do not use the solenoid valve to release the pressure in the hydraulic circuit.

Performance Curves

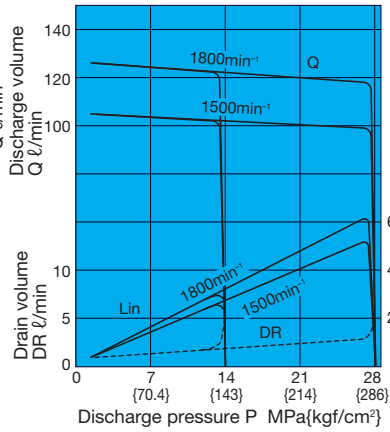
Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

PZS-3B-70N*-10

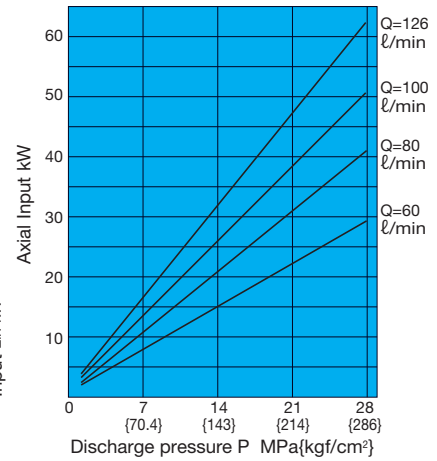
General Performance



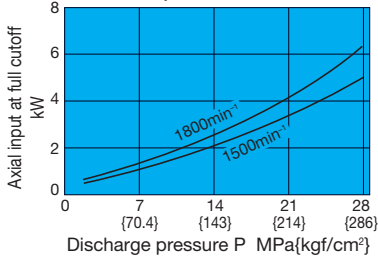
Pressure - Flow Rate Characteristics



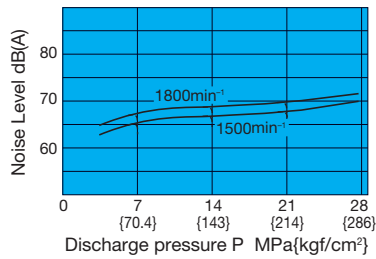
Axial Input



Axial Input at Full Cutoff



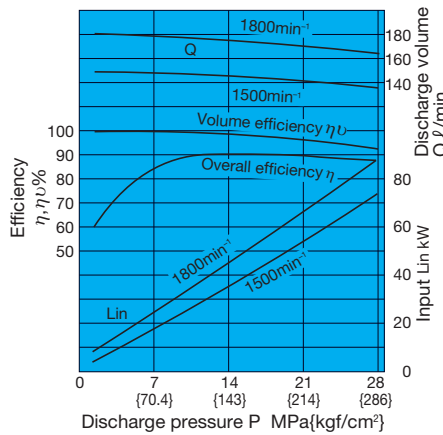
Noise Characteristics



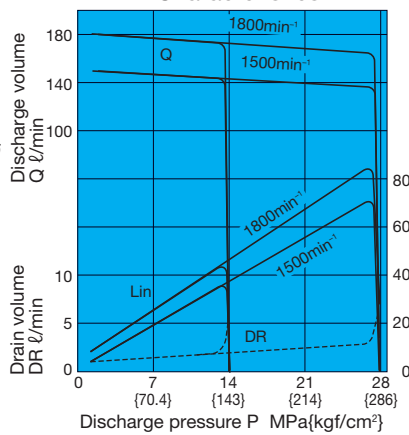
PZS-4B-100N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s

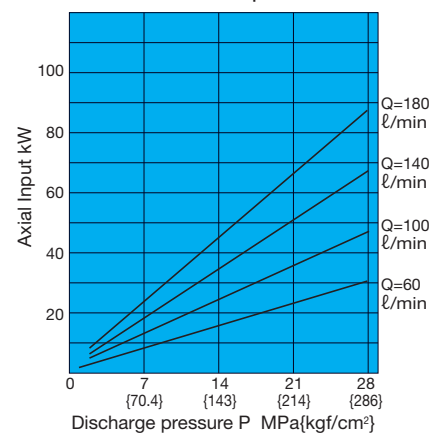
General Performance



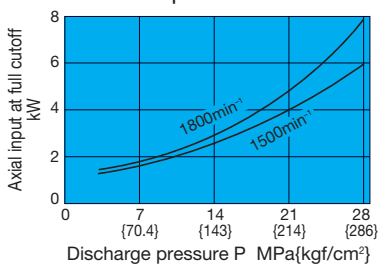
Pressure - Flow Rate Characteristics



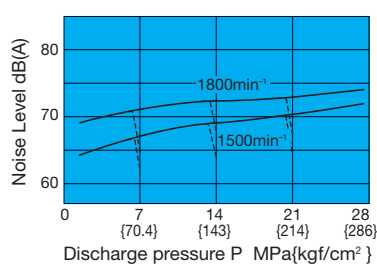
Axial Input



Axial Input at Full Cutoff

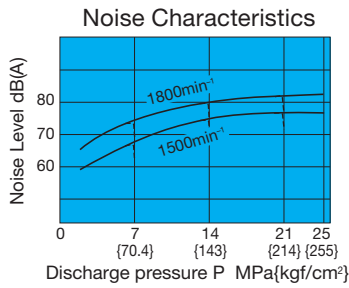
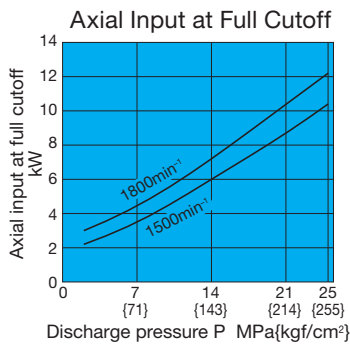
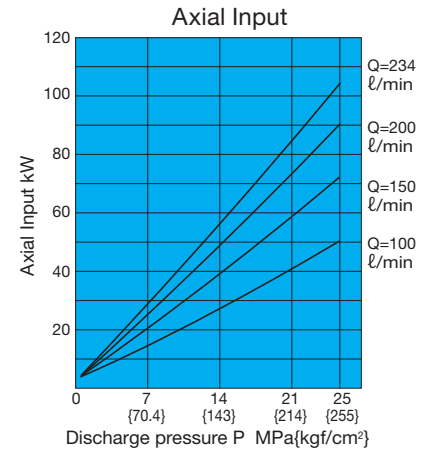
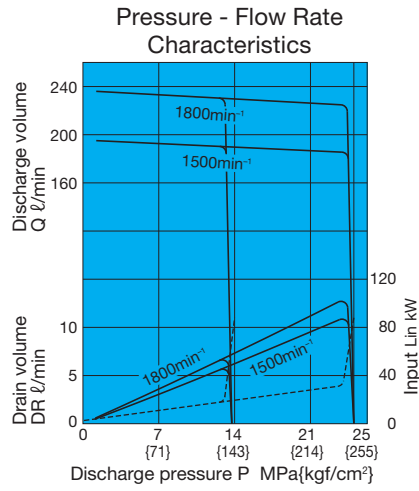
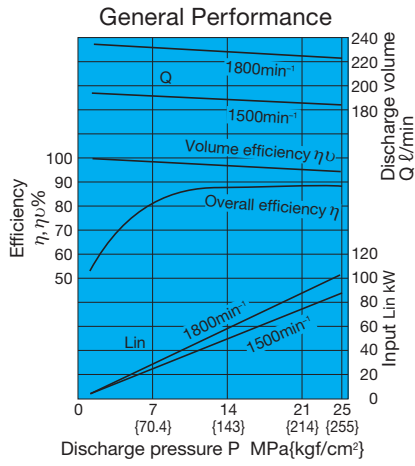


Noise Characteristics



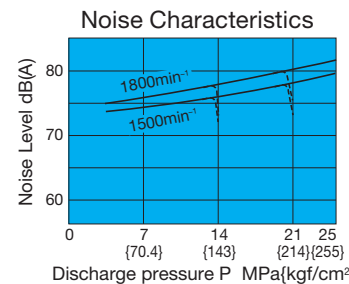
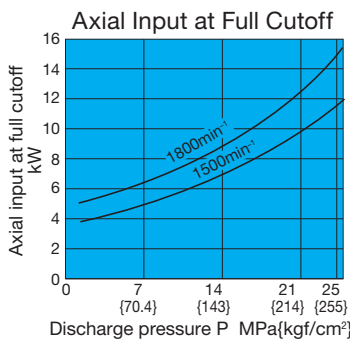
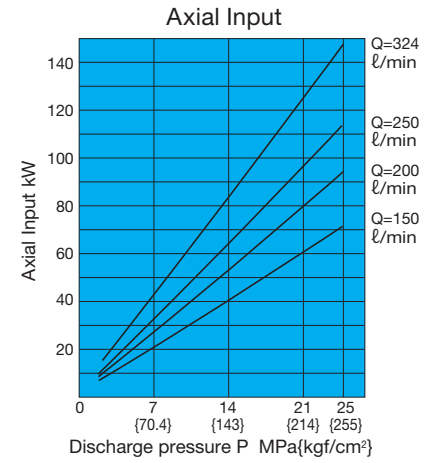
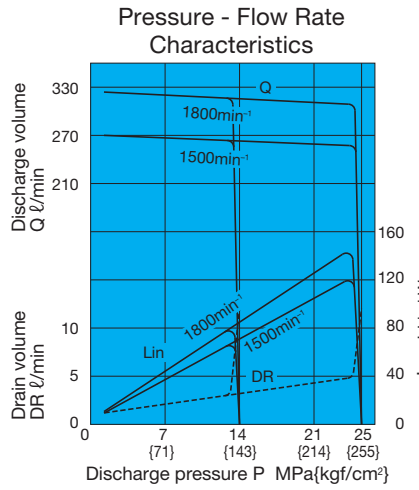
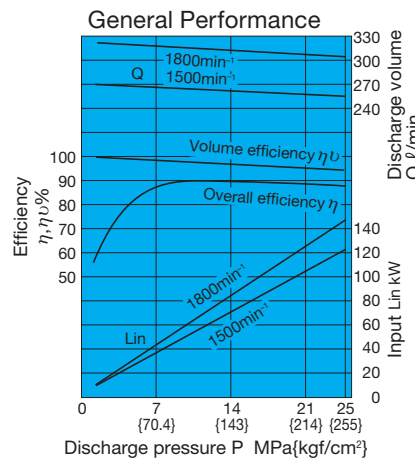
PZS-5B-130N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s



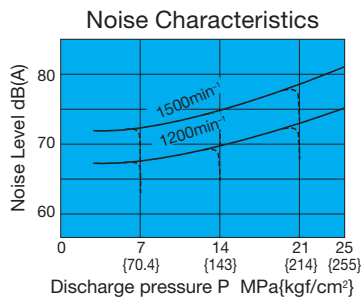
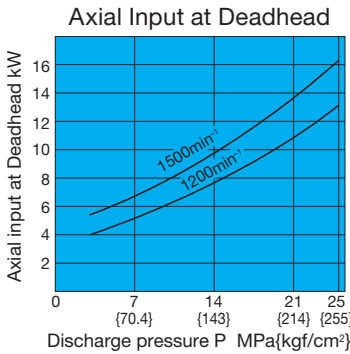
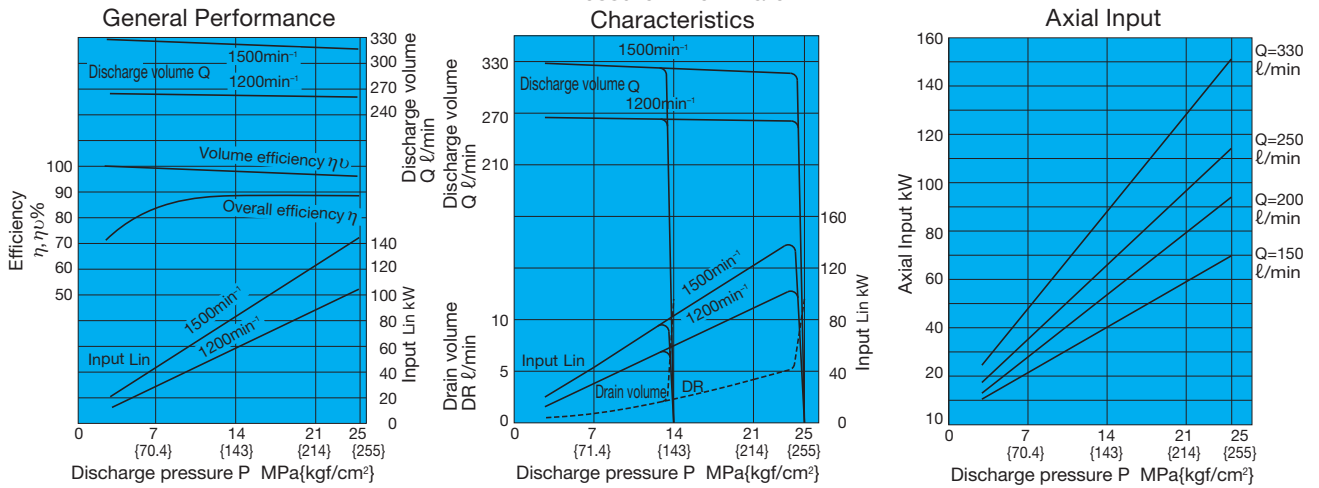
PZS-6B-180N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s



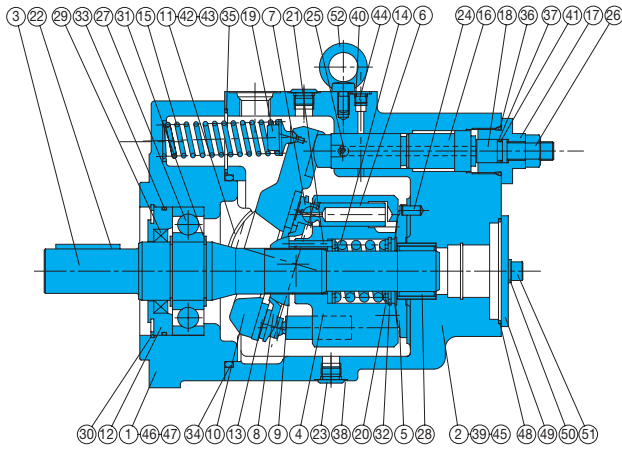
PZS-6B-220N*-10

Typical Characteristics at a Hydraulic Operating Fluid Kinematic Viscosity of 46 mm²/s



Cross-sectional Drawings

PZS-3B-70N*-10
 PZS-4B-100N*-10
 PZS-6B-**N*-10



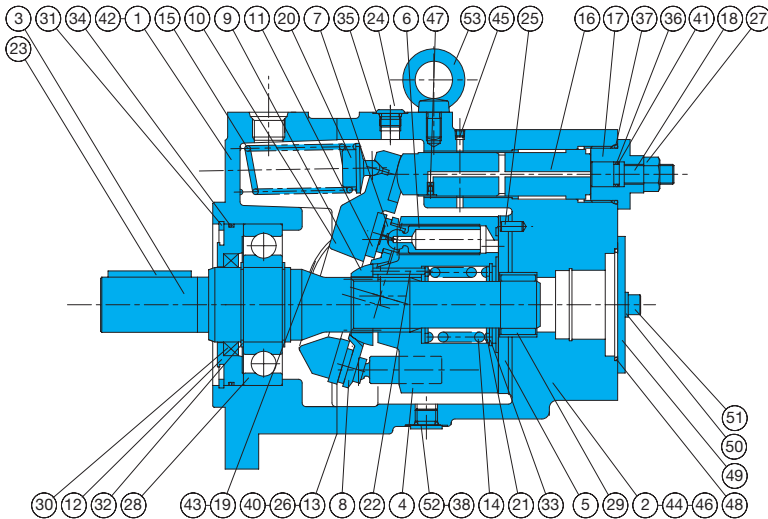
Part No.	Part Name	Part No.	Part Name
1	Body	28	Needle bearing
2	Case	29	Oil seal
3	Shaft	30	Snap ring
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	O-ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust bush	38	O-ring
12	Seal holder	39	O-ring
13	Thrust plate	40	O-ring
14	Spring C	41	Backup ring
15	Spring S	42	Orifice
16	Control piston	43	Flat philips head screw
17	End plug	44	Plug
18	Guide screw	45	Pin
19	Spring holder	46	Bolt
20	Retainer	47	Plug
21	Needle	48	O-ring
22	Key	49	Plate
23	Plug	50	Washer
24	Pin	51	Bolt
25	Orifice	52	Eye bolt
26	Nut		
27	Ball bearing		

List of Sealing Parts (Kit Model Number 3B : PZBS-103000, 4B : PZAS-104100, 6B : PZBS-106000)

Part No.	Name	Product Number				Remarks			
		PZS-3B	Q'ty	PZS-4B	Q'ty		PZS-6B	Q'ty	
29	Oil seal	TCN-456812	1	TCN-507212	1	TCN-659013	1	NOK	
33	O-ring	NBR-90 G95	1	NBR-90 G105	1	NBR-90 G135	1	JIS B 2401	
34	O-ring	NBR-90 G130	1	NBR-90 G155	1	NBR-90 G200	1	"	
35	O-ring	NBR-90 G50	1	NBR-90 G50	1	NBR-90 G65	1	"	
36	O-ring	NBR-90 P34	1	NBR-90 P36	1	NBR-90 P41	1	"	
37	O-ring	NBR-90 P12	1	NBR-90 P16	1	NBR-90 P16	1	"	
*	38	O-ring	NBR-90 P14	2	NBR-90 P14	3	NBR-90 P14	3	"
	39	O-ring	Note 1	1	NBR-90 P9	1	NBR-90 P10	1	"
	40	O-ring	NBR-90 P8	5	NBR-90 P8	5	NBR-90 P8	8	"
	41	Backup ring	T2-P12	1	T2-P16	1	T2-P16	1	JIS B 2407
	48	O-ring	Note 1	1	NBR-90 G85	1	NBR-90 G85	1	JIS B 2401

Note 1: Contact your agent about this type of O-ring. * Hydraulic fluid input changed to GPF 3/8. (from May 2008)

PZS-5B-130N*-10



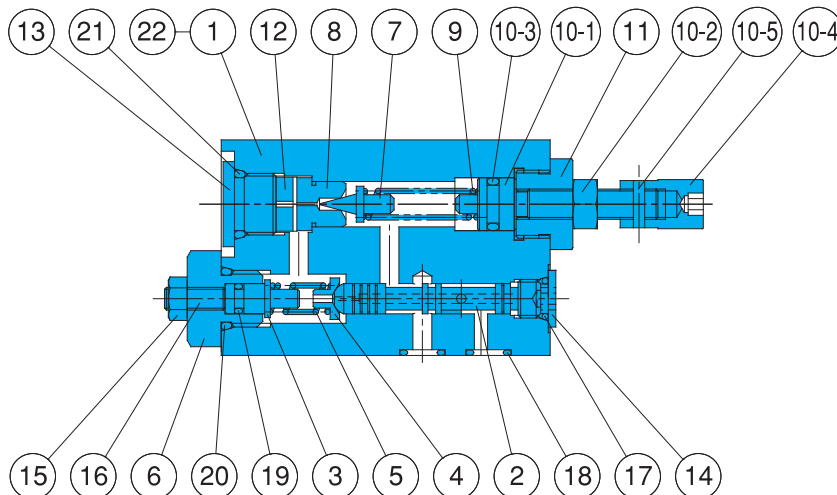
Part No.	Part Name	Part No.	Part Name
1	Body	28	Ball bearing
2	Case	29	Needle bearing
3	Shaft	30	Oil seal
4	Cylinder barrel	31	Snap ring
5	Valve plate	32	Snap ring
6	Piston	33	Snap ring
7	Shoe	34	O-ring
8	Shoe holder	35	O-ring
9	Barrel holder	36	O-ring
10	Swash plate	37	O-ring
11	Thrust plate	38	O-ring
12	Seal holder	39	O-ring
13	Gasket	40	O-ring
14	Spring C	41	Backup ring
15	Spring S	42	Bolt
16	Control piston	43	Flat philips head screw
17	End plug	44	Plug
18	Guide screw	45	Plug
19	Thrust bush	46	Plug
20	Spring holder	47	Orifice
21	Retainer	48	O-ring
22	Needle	49	Plate
23	Key	50	Washer
24	Plug	51	Bolt
25	Pin	52	Plug
26	Connector	53	Eye bolt
27	Nut		

PZS-5B (Kit Model Number 5B : PZAS-104000)

Part No.	Name	Q'ty	Size	Remarks
13	Gasket	1	*	3 Bond
30	Oil seal	1	TCN-608212	N. O. K
34	O-ring	1	NBR-90 G125	JIS B 2401
35	O-ring	2	NBR-90 P14	JIS B 2401
36	O-ring	1	NBR-90 P16	JIS B 2401
37	O-ring	1	NBR-90 P42	JIS B 2401
38	O-ring	1	NBR-90 P14	JIS B 2401
39	O-ring	5	NBR-90 P8	JIS B 2401
40	O-ring	2	NBR-90 P7	JIS B 2401
41	Backup ring	1	T2-P16	JIS B 2407
48	O-ring	1	NBR-90 G85	JIS B 2401

Parts marked by an asterisk "*" are not available on the market. Consult your agent.
 * Lubrication port changed to GPF 3/8. (from May 2008)

Pressure Compensator



Part No.	Part Name	Part No.	Part Name
1	Valve body	12	Collar
2	Spool	13	Plug
3	Spring guide	14	Plug
4	Spring bearing	15	Nut
5	Spring	16	Socket head screw
6	Retainer	17	O-ring
7	Needle valve	18	O-ring
8	Valve seat	19	O-ring
9	Spring	20	O-ring
10	Adjustment screw kit	21	O-ring
10-1	Adjustment screw	22	Plug
10-2	Nut		
10-3	O-ring		
10-4	Nut		
10-5	Spring pin		
11	Retainer		

List of Sealing Parts

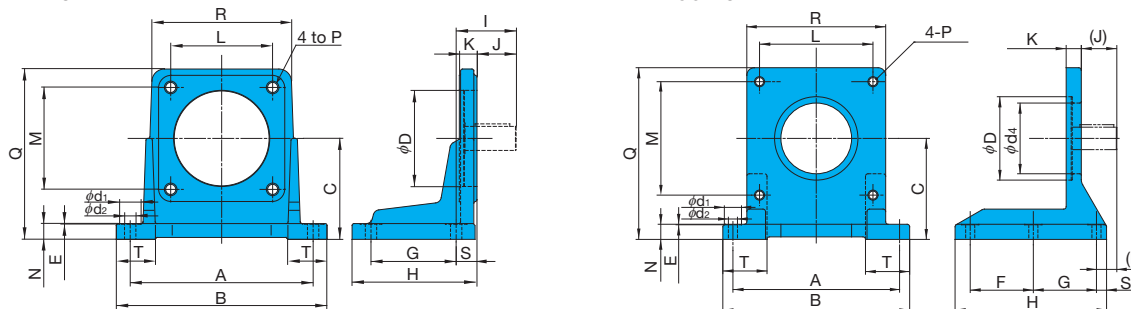
Part No.	Name	Part Number				Remarks
		PZS-3B, 4B	Q'ty	PZS-5B, 6B	Q'ty	
10-3	O-ring	NBR-90 P10A	1	NBR-90 P10A	1	JIS B 2401
17	O-ring	NBR-90 P8	1	NBR-90 P11	2	"
18	O-ring	NBR-90 P9	4	NBR-90 P9	5	"
19	O-ring	NBR-90 P5	1	NBR-90 P14	1	"
20	O-ring	NBR-90 P12	1	NBR-90 P22	1	"
21	O-ring	NBR-90 P14	1	NBR-90 P14	1	"

Foot Mounting Kit

Foot Mounting Installation Measurement Chart

PZM-*10

IHM-55-10



Foot Mounting Kit Model No.	Applicable Pump Model No.	Accessories				Measurements (mm)							
		Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F	G	H	(I)
PZM-3-10	PZS-3B	TH-16x40	4	WP-16	4	295.3	334	152.4	1	-	139.7	203	104.5
PZM-4-10	PZS-4B	TH-20x45	4	WP-20	4	290	334	160	1	-	135	198	95
IHM-55-10	PZS-5B, 6B	TH-20x50	4	WS-B-20	4	330	370	200	1	125	125	300	40

Foot Mounting Kit Model No.	Measurements (mm)														Weight kg
	(J)	K	L	M	N	P	Q	R	(S)	T	φ D	φ d1	φ d2	φ d4	
PZM-3-10	60	25	128	128	25	M16	259	-	44.5	61	127	35	18	86	13.5
PZM-4-10	62	28	161.6	161.6	25	M20	270	220	33	62	152.4	34	18	φ152.4	18.0
IHM-55-10	70 (Note)	30	224.6	224.6	30	M20	340	275	20	90	165.1	34	18	140	32.0

Note The IHM-55-10 (J) dimension (70) is the value for the PZS-5B. This dimension becomes 58 in the case of the PZS-6B. The IHM-55-10 (I) dimension (40) is the value for the PZS-5B. This dimension becomes 28 in the case of the PZS-6B. See the IHM-45-10 on pages B-36 and C-12 to see what the PZM-3-10 looks like.

Piping Flange Kit

Screw In Type

Screw In Type Flange Kit model No.	Applicable Pump Model No.	IN Flange							
		Flange Part No.	Bolt	Washer	O-ring				
PJF-10300T	PZS-3B	IH03J-100120	1	TH-12x55	4	WS-B-12	4	NBR-90 G50	1
PJF-10400T	PZS-4B	IH03J-100160	1	TH-12x60	4	WS-B-12	4	NBR-90 G60	1
PJF-10500T	PZS-5B	IH03J-100200	1	TH-12x65	4	WS-B-12	4	NBR-90 G75	1
PJF-10600T	PZS-6B	IH03J-100240	1	TH-16x75	4	WS-B-16	4	NBR-90 G85	1

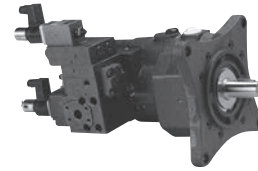
OUT Flange							
Flange Part No.	Bolt	Washer	O-ring				
IH03J-100100	1	TH-10x55	4	WS-B-10	4	NBR-90 G40	1
IH03J-100160	1	TH-12x60	4	WS-B-12	4	NBR-90 G60	1
IH03J-100200	1	TH-12x65	4	WS-B-12	4	NBR-90 G75	1
IH03J-100200	1	TH-12x65	4	WS-B-12	4	NBR-90 G75	1

Welded Type

Welded Type Flange Kit model No.	Applicable Pump Model No.	IN Flange							
		Flange Part No.	Bolt	Washer	O-ring				
PJF-10300E	PZS-3B	IH03J-200120	1	TH-12x55	4	WS-B-12	4	NBR-90 G50	1
PJF-10400E	PZS-4B	IH03J-200160	1	TH-12x60	4	WS-B-12	4	NBR-90 G60	1
PJF-10500E	PZS-5B	IH03J-200200	1	TH-12x65	4	WS-B-12	4	NBR-90 G75	1
PJF-10600E	PZS-6B	IH03J-200240	1	TH-16x75	4	WS-B-16	4	NBR-90 G85	1

OUT Flange							
Flange Part No.	Bolt	Washer	O-ring				
IH03J-200100	1	TH-10x55	4	WS-B-10	4	NBR-90 G40	1
IH03J-200160	1	TH-12x60	4	WS-B-12	4	NBR-90 G60	1
IH03J-200200	1	TH-12x65	4	WS-B-12	4	NBR-90 G75	1
IH03J-200200	1	TH-12x65	4	WS-B-12	4	NBR-90 G75	1

- See page C-11 for dimensions.
- The materials and hardness of the O-ring conform with JIS B2401
- See page C-11 for details on tightening torque.



PZ Series Load Sensitive Variable Piston Pump

35 to 220cm³/rev
21MPa

Features

- ① The PZ Series load sensitive variable piston pump employs the semi-cylindrical swash plate that is part of the basic technology used by the PVS series variable piston pump. To this it adds a hydrostatic bearing mechanism, valve plate, and other noise reducing mechanisms for operation that is even quieter than that of PVS Series pumps.
- ② The pump body houses an electro-hydraulic proportional control valve, compensator, and surge cutoff valve, which eliminates the need for superfluous piping.
- ③ The electro-hydraulic proportional

control valve uses the proven force feedback system for improved hysteresis, repeatability, and response.

- ④ The ability to create a double pump configuration with an IP pump further expands the range of possible applications.

Specifications

Pump System Specifications

Model No.	Pump Capacity cm ³ /rev	Maximum Working Pressure MPa {kgf/cm ² }	Pressure Adjustment Range MPa {kgf/cm ² }	Flow Control Limit Range ℓ/min Note 3	Revolution Speed min ⁻¹		Weight kg	Fixed Discharge Pump Note 1	
					Min.	Max.		Capacity cm ³ /rev	Pressure MPa {kgf/cm ² }
PZ-2B-* 35E1A-11 2 3	35	21 {214}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	1 to 63	600	2000	36	3.6 to 8.18	21 {214}
PZ-2B-* 45E1A-11 2	45	14 {143}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 }	1 to 80	600	2000	36	3.6 to 8.18	21 {214}
PZ-3B-* 70E1A-10 2 3	70	21 {214}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	1 to 126	600	1800	60	3.6 to 15.8	21 {214}
PZ-4B-* 100E1A-10 2 3	100	21 {214}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	1 to 180	600	1800	76	3.6 to 15.8	21 {214}
PZ-5B-* 130E1A-10 2 3 (Note 2)	130	21 {214}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	3 to 234	600	1800	100	3.6 to 32.3	21 {214}
PZ-6B-* 180E1A-20 2 3	180	21 {214}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	3 to 324	600	1800	160	3.6 to 63.9	21 {214}
PZ-6B-* 220E1A-20 2 3	220	21 {214}	2 to 7 {20.4 to 71.4 } 2 to 14 {20.4 to 143 } 2 to 21 {20.4 to 214 }	3 to 330	600	1500	162	3.6 to 63.9	21 {214}

Note1. Can be used in combination with an IP pump to configure a fixed discharge pump.

Note2. The PZ-4B-130 model number was changed to PZ-5B-130.

Note3. Maximum flow rate depends on the revolution speed. Values in the above table are for a speed of 1800min⁻¹ for the PZ-2B to PZ-6B-180, and 1500min⁻¹ for the PZ-6B-220.

Pressure/Flow Rate Control System Specifications

Pressure Control System

Pressure Control Range MPa {kgf/cm ² }	1 : 2 to 7 {20.4 to 71.4 } 2 : 2 to 14 {20.4 to 143 } 3 : 2 to 21 {20.4 to 214 }
Rated Current mA	800
Coil Resistance Ω	20(20°C)
Hysteresis %	3% max. Note 1

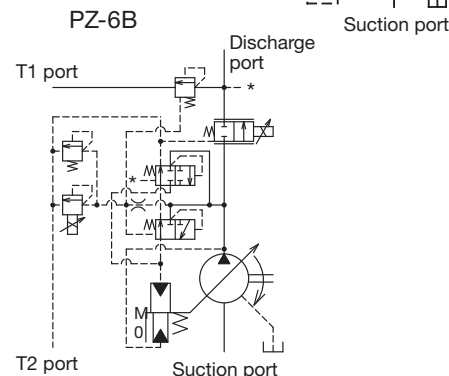
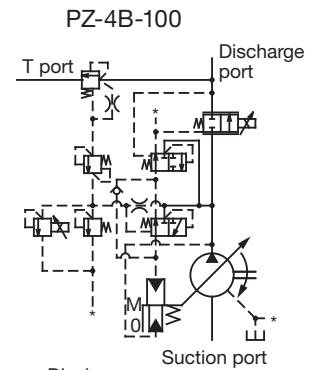
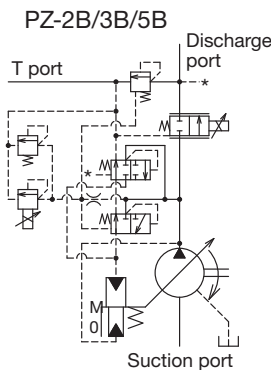
Flow Rate Control System

Valve Differential Pressure MPa {kgf/cm ² }	1 {10} Note 2
Rated Current mA	800
Coil Resistance Ω	20(20°C)
Hysteresis %	3% max. Note 1

Note 1. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

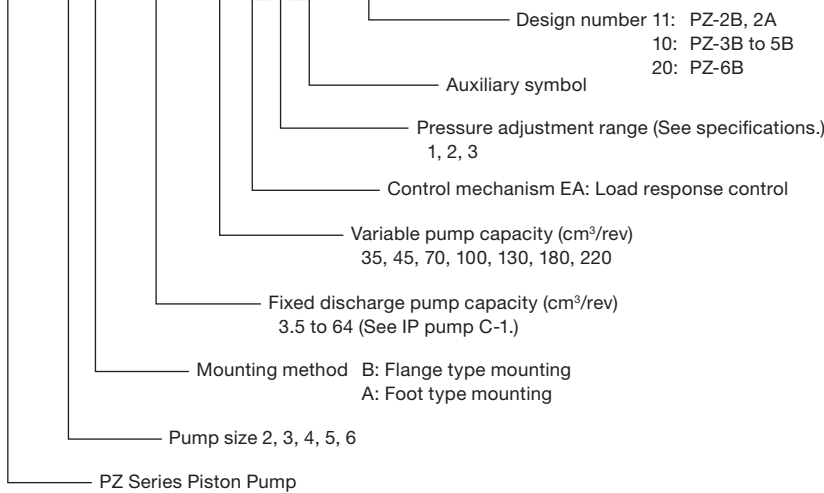
Note 2. Pressure differential of pump discharge pressure (valve IN side) and load pressure (valve OUT side).

Note 3. For information about power amplifiers, see pages I-26 through I-37.



Explanation of model No.

PZ - 3 B - 10 - 70 E 2 A - 10



● Handling

● Pump Installation and Piping Precautions

- 1 Use flexible couplings for connecting the pump shaft to the drive shaft, and prevent radial or thrust load from being applied to the pump shaft.
- 2 Eccentricity between the drive shaft and pump shaft should be no greater than 0.05mm, with an eccentric angle error of 1° or less.
- 3 Keep the fitting length of couplings and pump shafts at least 2/3 the length of the coupling width.
- 4 Use a sufficiently rigid pump mounting base.
- 5 Set pump suction side pressure to -0.03 MPa or more (suction port flow velocity less than 2 m/sec).
- 6 Raise part of the drain piping so it is above the topmost part of the pump body, and insert the return section of the drain piping into the hydraulic operating fluid. Also, observe the values in the following table in order to limit the drain back pressure to 0.1 MPa

Item Model No.	PZ-2B	3B PZ-4B 5B	PZ-6B
Pipe Joint Size	At least 1/2"	At least 3/4"	At least 1"
Pipe I.D.	At least ϕ 12	At least ϕ 17	At least ϕ 22
Pipe Length	1 m or less	1 m or less	1 m or less

- 7 Mount the pump so the pump shaft is oriented horizontally.
- 8 Use of rubber hose is recommended in order to minimize noise and vibration.

● Management of Hydraulic Operating Fluid

- 1 Use only good-quality hydraulic operating fluid with a kinematic viscosity during operation within the range of 20 to 200 mm²/sec. Normally, you should use an R&O type and wear-resistant type of ISOGV32 to 68 or equivalent. The optimum kinematic viscosity during operation is 20 to 50 mm²/sec.
- 2 The operating temperature range is 5 to 60°C. When the oil temperature at startup is 5°C or less, run the pump at low pressure until the oil temperature reaches 5°C.
- 3 Provide a suction strainer with a filtering grade of about 100 μ (150 mesh). Provide a return line filter of grade 20 μ m or less on the return line to the tank. (When the pump is used at a high pressure of 14 MPa or greater, a filter of 10 μ m or less is recommended.)
- 4 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower.
- 5 Use hydraulic operating fluid when the operating ambient temperature is in the range of 0 to 60°C.

● Inverter Drive Precautions

- 1 Set the revolution speed within the range of the pump specification revolution speed.
- 2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

● Startup Precautions

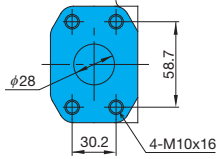
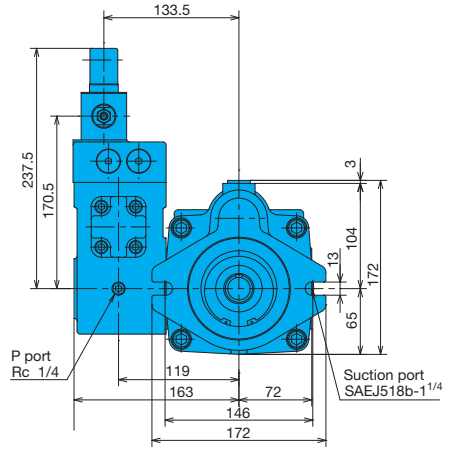
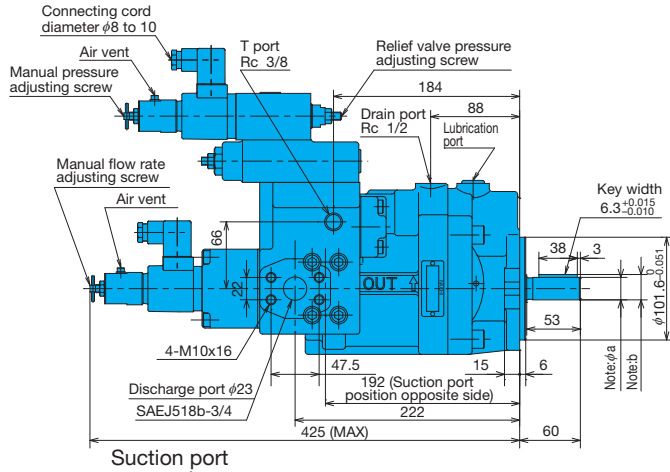
- 1 Before starting up the pump, fill the pump body with clean hydraulic operating fluid through the lubrication port.

Model No.	Oil Amount cm ³
PZ-2B	650
PZ-3B	1000
PZ-4B	1800
PZ-5B	2200
PZ-6B	3000

- 2 Check to make sure that the rotation direction of the pump is the same as the rotation direction indicated by the arrow on the pump body.
- 3 Air entering the pump or pipes can cause noise or vibration. At startup, set the pump discharge side to a no-load state, and operate the pump in the inching mode to remove any air that might be in the pump or pipes.
- 4 Equip an air bleed valve in circuits where it is difficult to release air before startup. (See "IP Pumps" on page C-13.)
- 5 To enable superior pressure and flow control, loosen the air vent when starting up the pump in order to release any air, and fill the inside of the solenoid with hydraulic operating fluid. You can change the position of the air vent by rotating its cover.
- 6 Before adjusting the manual adjusting screw from the first time or when there is no input current to the valve due to electrical malfunction or some other reason, you can control pump pressure and flow rate by rotating the manual adjusting screw. Normally, the manual adjusting screw should be returned completely to its original position and secured with the lock nut.

Installation Dimension Drawings

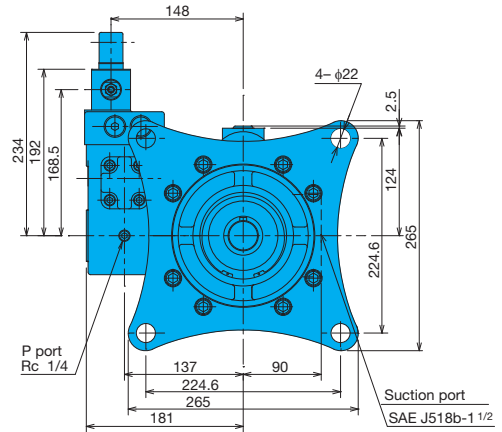
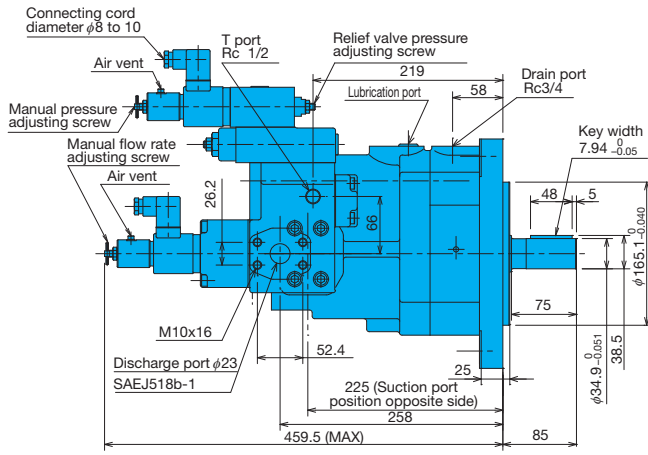
PZ-2B-35
45



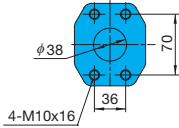
Note

	ϕa	b
Single Pump	$\phi 22.23^{0}_{-0.021}$	$24.9^{0}_{-0.5}$
Double Pump with Fixed Flow IP	$\phi 25.385^{0}_{-0.025}$	$27.85^{0}_{-0.25}$

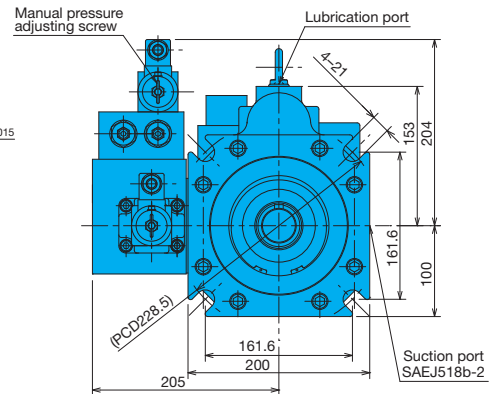
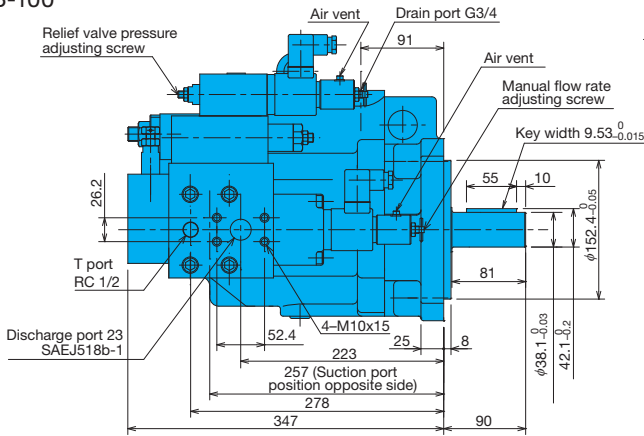
PZ-3B-70



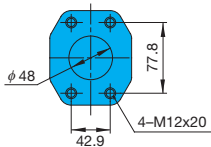
Suction port



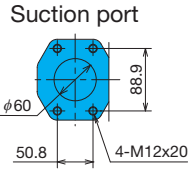
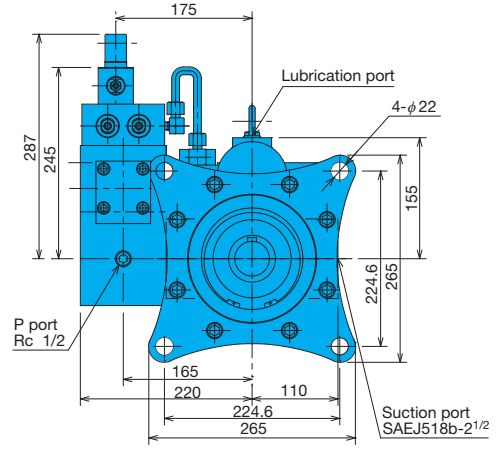
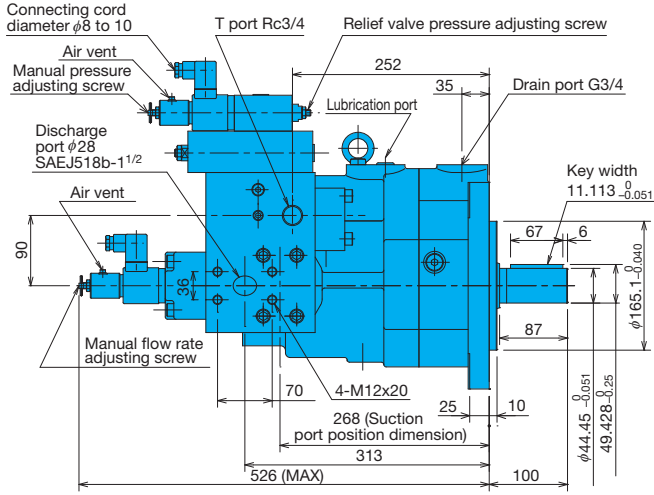
PZ-4B-100



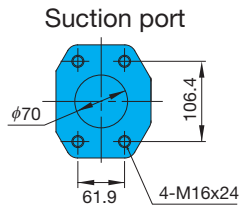
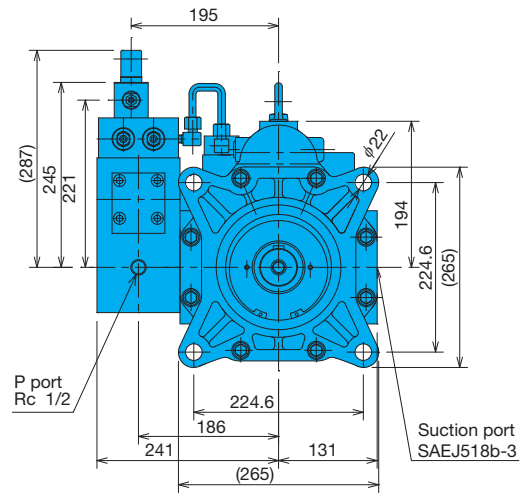
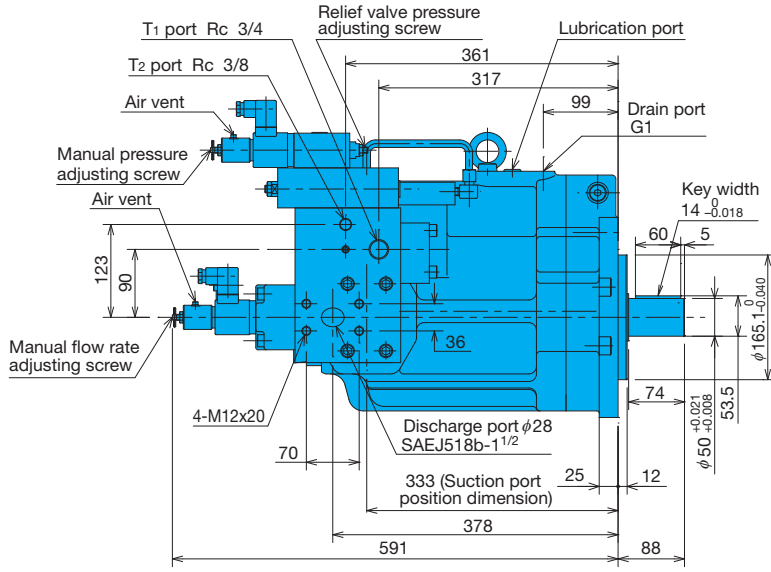
Suction port



PZ-5B-130



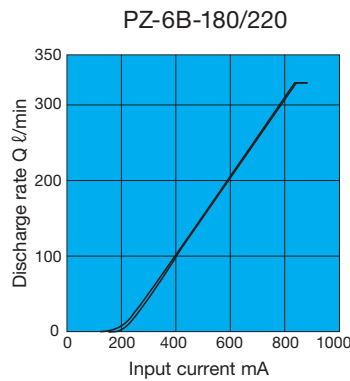
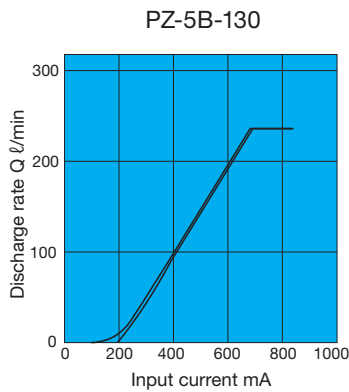
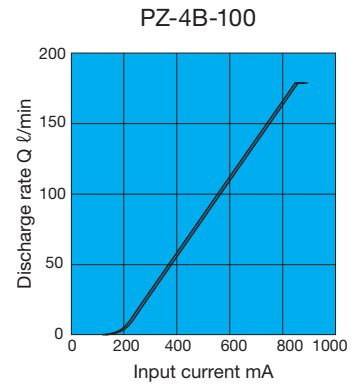
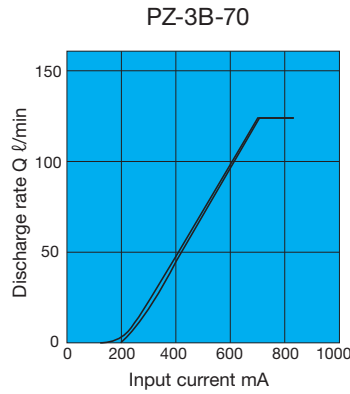
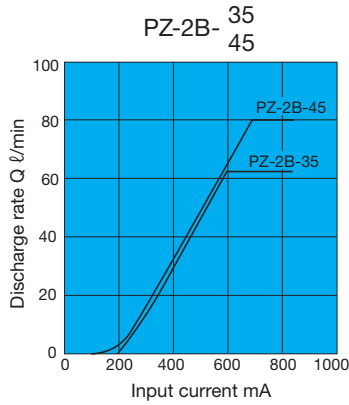
PZ-6B-180
220



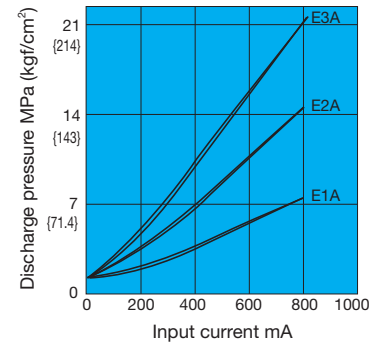
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

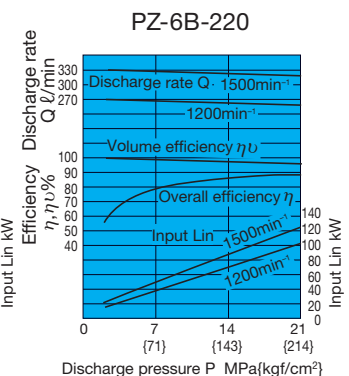
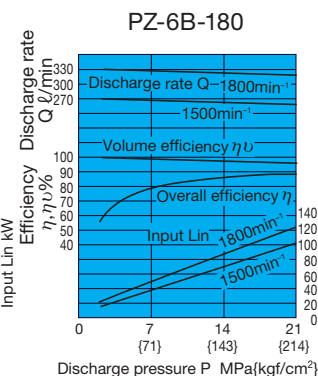
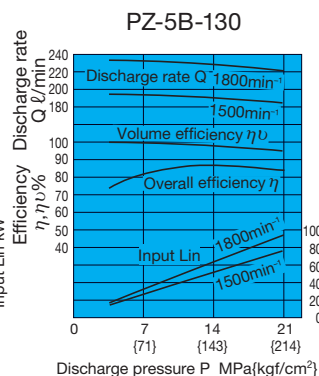
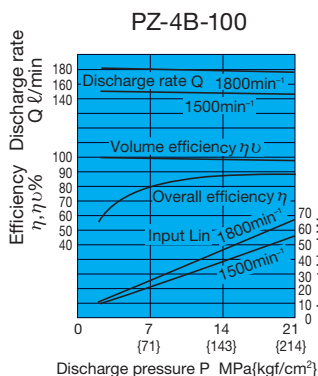
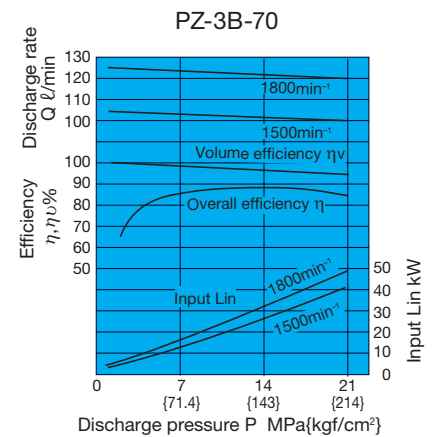
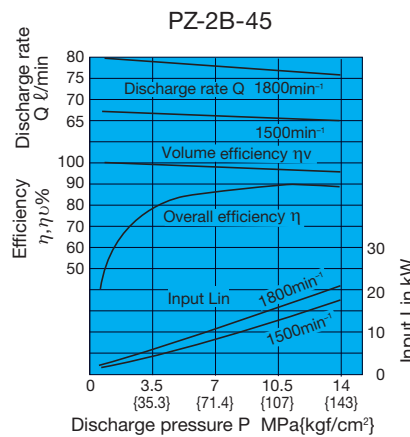
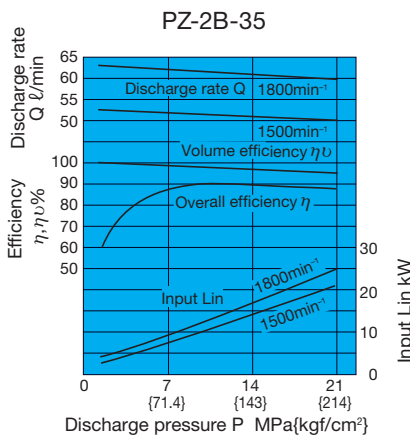
Input Current–Discharge Rate Characteristics



Input Current–Discharge Pressure Characteristics

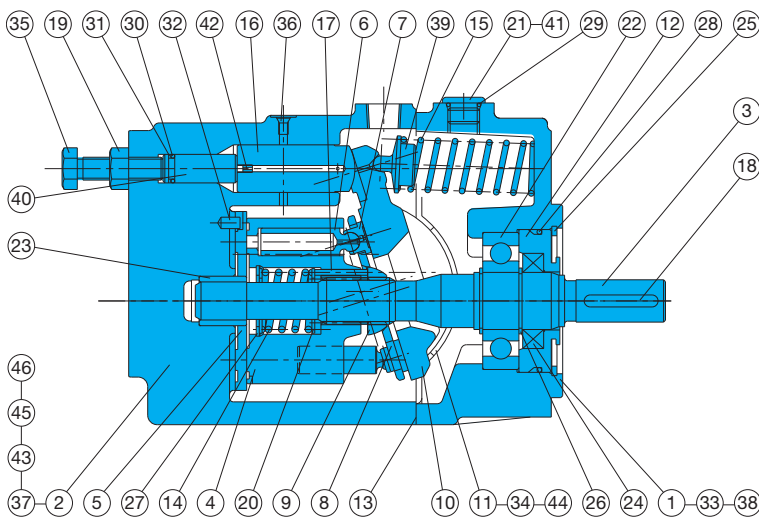


General Performance



Cross-sectional Drawings

PZ-2B-35
45 E*A-11



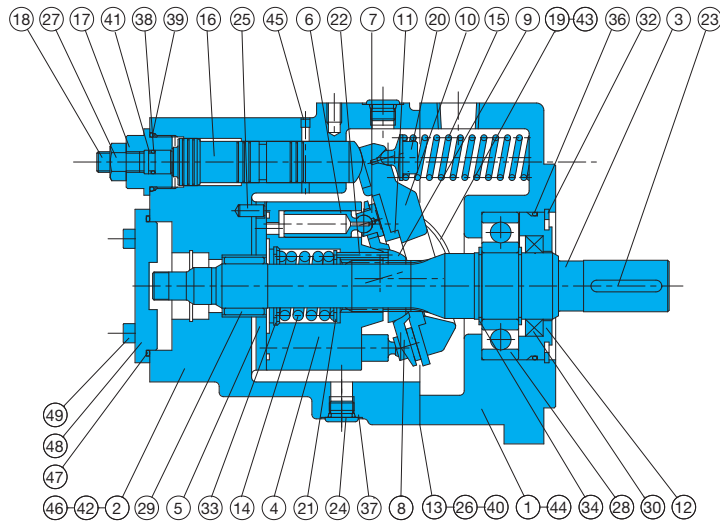
Part No.	Part Name	Part No.	Part Name
1	Body	24	Oil seal
2	Case	25	Snap ring
3	Shaft	26	Snap ring
4	Cylinder barrel	27	Snap ring
5	Valve plate	28	O-ring
6	Piston	29	O-ring
7	Shoe	30	O-ring
8	Shoe holder	31	Backup ring
9	Barrel holder	32	Pin
10	Swash plate	33	Screw
11	Thrust bush	34	Screw
12	Seal holder	35	Screw
13	Gasket	36	Plug
14	Spring C	37	Plug
15	Spring S	38	Plug
16	Control piston	39	Spring holder
17	Needle	40	Guide
18	Key	41	Hydraulic fluid input seal
19	Nut	42	Orifice
20	Retainer	43	Pin
21	Plug	44	Orifice
22	Ball bearing	45	Connector
23	Needle bearing	46	O-ring

List of Sealing Parts (Kit Model Number PSBS-102220)

Part No.	Part Name	Q'ty	Size	Remarks
* 13	Gasket	1	PS46-102000-0A	3 Bond
24	Oil seal	1	TCN-305011	N. O. K
28	O-ring	1	NBR-90 G70	JIS B 2401
29	O-ring	1	NBR-90 P14	JIS B 2401
30	O-ring	1	NBR-90 P11	JIS B 2401
31	Backup ring	1	T2-P11	JIS B 2407
46	O-ring	2	NBR-90 P5	JIS B 2401

Parts marked by an asterisk "*" are not available on the market. Consult your agent.

PZ-3/5B-*E*A-10



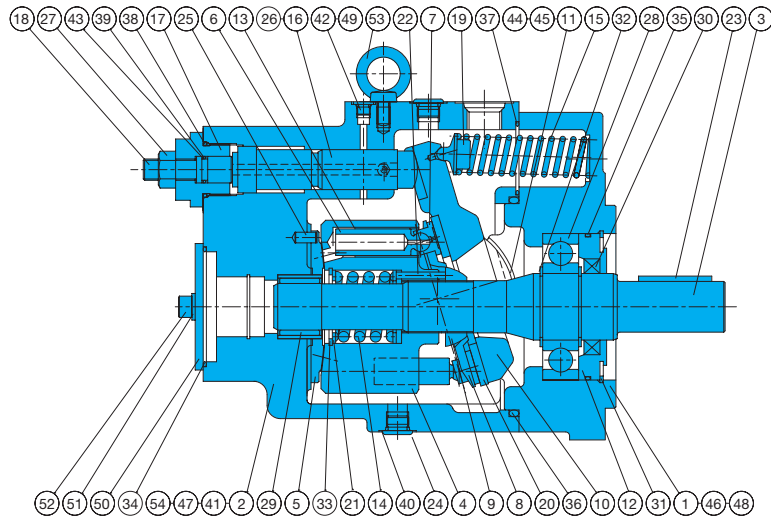
Part No.	Part Name	Part No.	Part Name
1	Body	24	Plug
2	Case	25	Pin
3	Shaft	26	Connector
4	Cylinder barrel	27	Nut
5	Valve plate	28	Ball bearing
6	Piston	29	Needle bearing
7	Shoe	30	Oil seal
8	Shoe holder	32	Snap ring
9	Barrel holder	33	Snap ring
10	Swash plate	34	Snap ring
11	Thrust plate	36	O-ring
12	Seal holder	37	O-ring
13	Gasket	38	O-ring
14	Spring C	39	O-ring
15	Spring S	40	O-ring
16	Control piston	41	Backup ring
17	End plug	42	Bolt
18	Guide screw	43	Screw
19	Thrust bush	44	Plug
20	Spring holder	45	Plug
21	Retainer	46	Pin
22	Needle	47	O-ring
23	Key	48	Plate
		49	Screw

List of Sealing Parts (Kit Model Number 3B; PZAS-103200, 5B; PZAS-104000)

Part No.	Part Name	PZ-3B		PZ-5B		Remarks
		Size	Q'ty	Size	Q'ty	
13	Gasket	*	1	*	1	3 Bond
30	Oil seal	TCN-456812	1	TCN-608212	1	N. O. K
36	O-ring	NBR-90 G95	1	NBR-90 G125	1	JIS B 2401
37	O-ring	NBR-90 P14	2	NBR-90 P21	2	JIS B 2401
38	O-ring	NBR-90 P12	1	NBR-90 P16	1	JIS B 2401
39	O-ring	NBR-90 P34	1	NBR-90 P42	1	JIS B 2401
40	O-ring	NBR-90 P7	2	NBR-90 P7	2	JIS B 2401
41	Backup ring	T2-P12	1	T2-P16	1	JIS B 2407
47	O-ring	NBR-90 G90	1	NBR-90 G85	1	JIS B 2401

Parts marked by an asterisk "*" are not available on the market. Consult your agent.

* Lubrication port changed to GPF 3/8. (from May 2008)



Part No.	Part Name	Part No.	Part Name
1	Body	31	Snap ring
2	Case	32	Snap ring
3	Shaft	33	Snap ring
4	Cylinder barrel	34	O-ring
5	Valve plate	35	O-ring
6	Piston	36	O-ring
7	Shoe	37	O-ring
8	Shoe holder	38	O-ring
9	Barrel holder	39	O-ring
10	Swash plate	40	O-ring
11	Thrust bush	41	O-ring
12	Seal holder	42	O-ring
13	Sleeve	43	Backup ring
14	Spring C	44	Orifice
15	Spring S	45	Screw
16	Control piston	46	Plug
17	End plug	47	Pin
18	Guide screw	48	Bolt
19	Spring holder	49	Plug
20	Thrust plate	50	Plate
21	Retainer	51	Washer
22	Needle	52	Bolt
23	Key	53	Eye bolt
24	Plug	54	Electro-hydraulic proportional valve
25	Pin		
26	Orifice		
27	Nut		
28	Ball bearing		
29	Needle bearing		
30	Oil seal		

List of Sealing Parts (Kit Model Number 4B : PZAS-104100, 6B : PZBS-106000)

Part No.	Part Name	PZ-4B		PZ-6B		Remarks
		Size	Q'ty	Size	Q'ty	
30	Oil seal	TCN-507212	1	TCN-659013	1	N. O. K
34	O-ring	NBR-90 G85	1	NBR-90 G85	1	JIS B 2401
35	O-ring	NBR-90 G105	1	NBR-90 G135	1	JIS B 2401
36	O-ring	NBR-90 G155	1	NBR-90 G200	1	JIS B 2401
37	O-ring	NBR-90 G50	1	NBR-90 G65	1	JIS B 2401
38	O-ring	NBR-90 P36	1	NBR-90 P41	1	JIS B 2401
39	O-ring	NBR-90 P16	1	NBR-90 P16	1	JIS B 2401
40	O-ring	NBR-90 P14	3	NBR-90 P14	3	JIS B 2401
41	O-ring	NBR-90 P9	1	NBR-90 P10	1	JIS B 2401
42	O-ring	NBR-90 P8	5	NBR-90 P8	8	JIS B 2401
43	Backup ring	T2-P16	1	T2-P16	1	JIS B 2407

* Lubrication port changed to GPF 3/8. (from May 2008)

Foot Mounting Kit

Pump Model No.	Mounting Model No.
PZ-2B	IHM-44-10
PZ-3B PZ-5B PZ-6B	IHM-55-10
PZ-4B	PZM-4-10

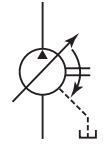
Note: See pages C-12 and A-34 for information about mounting methods.

Piping Flange Kit

Flange Kit model No.	Applicable Pump Model No.	IN Flange							
		Flange Part No.	Bolt	Washer	O-ring				
IHF -4-T-20	PZ-2B-35/45	IH03J-100100	1	TH-10×55	4	WS-B-10	4	NBR-90 G40	1
IHF -5-T-20	PZ-3B-70	IH03J-100120	1	TH-12×55	4	WS-B-12	4	NBR-90 G50	1
PZF-4-T-10	PZ-4B-100	IH03J-100160	1	TH-12×60	4	WS-B-12	4	NBR-90 G60	1
IHF -7-T-10	PZ-5B-130	IH03J-100200	1	TH-12×60	4	WS-B-12	4	NBR-90 G75	1
PZF-6-T-10	PZ-6B-180/220	IH03J-100240	1	TH-16×75	4	WS-B-16	4	NBR-90 G85	1

OUT Flange								Plug	
Flange Part No.	Bolt	Washer	O-ring						
IH03J-100060	1	TH-10×50	4	WS-B-10	4	NBR-90 G30	1	TPHA-1/4	1
IH03J-100080	1	TH-10×50	4	WS-B-10	4	NBR-90 G35	1	TPHA-1/4	2
IH03J-100080	1	TH-10×50	4	WS-B-10	4	NBR-90 G35	1	TPHA-1/4	1
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	TPHA-1/4	1
IH03J-100120	1	TH-12×60	4	WS-B-12	4	NBR-90 G50	1	TPHA-1/4	1

Note 1. See page C-11 for dimensions.
 2. The materials and hardness of the O-ring conform with JIS B2401.
 3. See page C-11 for details on tightening torque.



VDS Series Small Variable Volume Vane Pump

8cm³/rev
15ℓ
7MPa

Features

① High efficiency operation with minimal power loss

All the performance of the original new VDR series mechanisms combines with precision machining for a pump that minimizes power loss, especially at full cutoff.

② Quiet operation

Journal bearings with a proven record on IP pumps plus new suction and discharge port configurations reduce operating noise and deliver quiet operation with minimal vibration, even in the

high-pressure range.

③ Compact and simple design, easy operation

Compact and quiet, VDS Series variable vane pumps are economical and easy to handle. A simple design allows use in a wide range of hydraulic systems.

④ Precise characteristics, prompt response

Prompt response at both ON-OFF and OFF-ON ensures instantaneous, stable,

high-precision operation.

⑤ Solidly built for high efficiency and long life

VDS Series pumps are built to last, with a design that incorporates years of NACHI experience and know-how. Specially selected materials and skilled workmanship provide outstanding durability along with stable, high-efficiency operation.

Specifications

Model No.	Capacity cm ³ /rev	No-load Discharge Rate ℓ/min				Pressure Adjustment Range MPa {kgf/cm ² }	Allowable Peak Pressure MPa {kgf/cm ² }	Revolution Speed min ⁻¹		Weight kg
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
VDS-0A(B)-1A1-10						1 to 2 {10.2 to 20.4}				
" -1A2 "	8.3	8	10	12.5	15	1.5 to 3.5 {15.3 to 35.7}	14 {143}	800	1800	A : 6.5 B : 4.5
" -1A3 "						3 to 7 {30.6 to 71.4}				

● Handling

- The direction of rotation for this pump is clockwise (rightward) when viewed from the shaft side.
- Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 0.03MPa.
- When adjusting pressure, pressure is increased by clockwise (rightward) rotation of the adjusting screw and decreased by counterclockwise (leftward) rotation.
- When adjusting the flow rate, the flow rate is decreased by clockwise (rightward) rotation of the adjusting screw and increased by counterclockwise (leftward) rotation. The graph on the right provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.
- Factory Default P-Q Settings (Standard Model)
 - Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
 - Pressure Setting = Pressure shown in table below

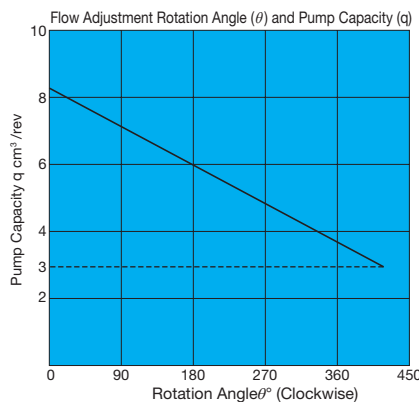
Factory Default Pressure Settings MPa{kgf/cm ² }
1 : 2.0 {20.4}
2 : 3.5 {35.7}
3 : 7.0 {71.4}

However: $Q=q \times n \times 10^{-3}$

Q : No-load Discharge Rate (ℓ/min)

q : Capacity (cm³/rev)

N : Revolution Speed min⁻¹



The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position.

The broken line shows the flow volume adjustment range lower limit value.

⑥ Thrust Screw

The thrust screw is precisely adjusted at the factory during assembly. Never touch the thrust screw. See callout ⑨ in the cross-section diagram on page B-4.

⑦ Initial Operation

Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit.

⑧ For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating fluid that provides kinematic viscosity during operation in the range of 20 to 150mm²/s.

⑨ The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

(Continued on following page)

- 10 Suction pressure is -0.03 to $+0.03$ MPa (-0.3 to $+0.3$ kgf/cm²), and the suction port flow rate should be greater than 2m/sec.
- 11 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 12 Provide a suction strainer with a filtering grade of about 100 μ m (150 mesh). For the return line to the tank, use a 25 μ m line filter.
- 13 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water or other foreign matter, and watch for discoloration.

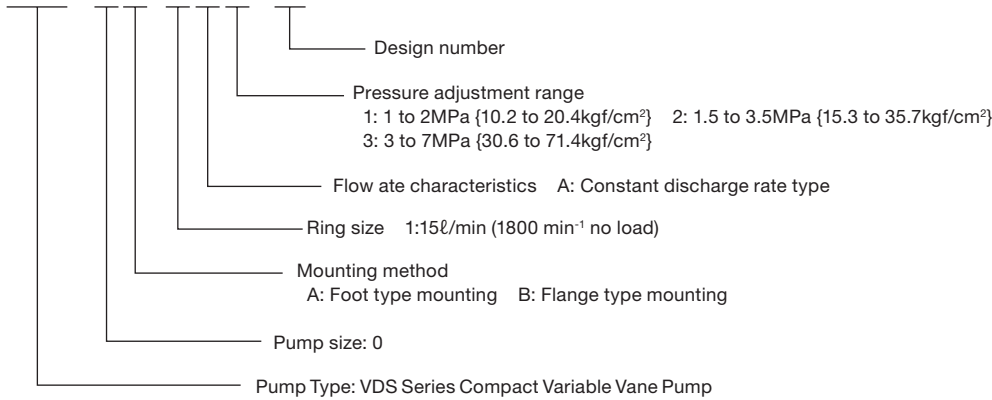
- Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 14 At startup, repeat the inching operation (start-stop) to prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)
- 15 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 16 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. The angle error should be no greater than 1°.

● Inverter Drive Precautions

- 1 Set the revolution speed within the range of the pump specification revolution speed.
- 2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Explanation of model No.

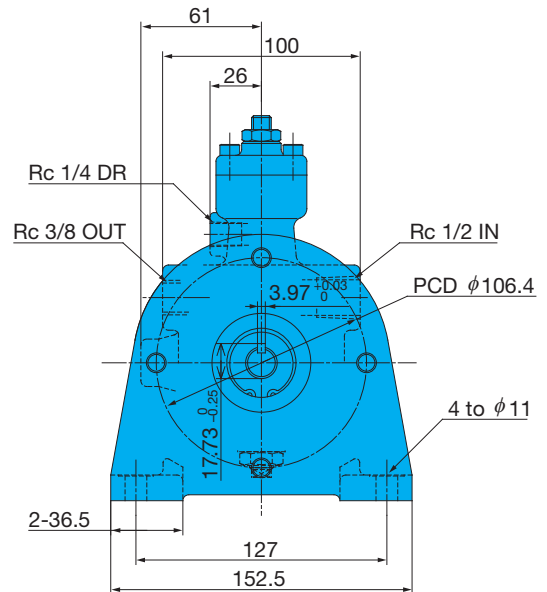
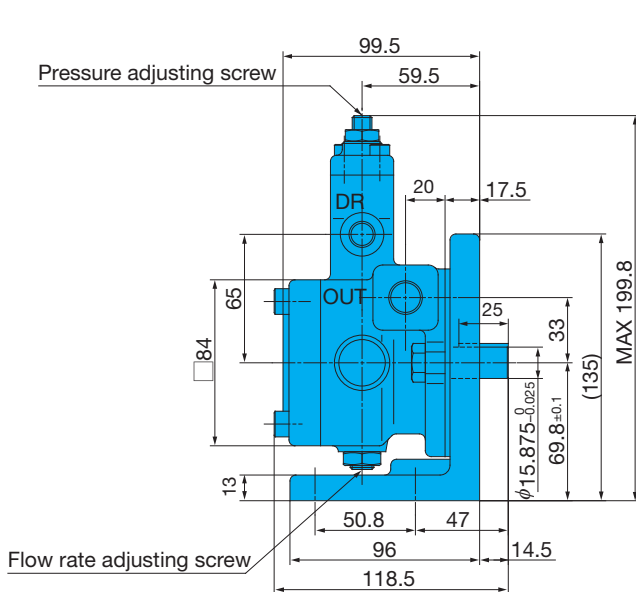
VDS - 0 * - 1 A * - 10



Installation Dimension Drawings

VDS-0A-1A*-10

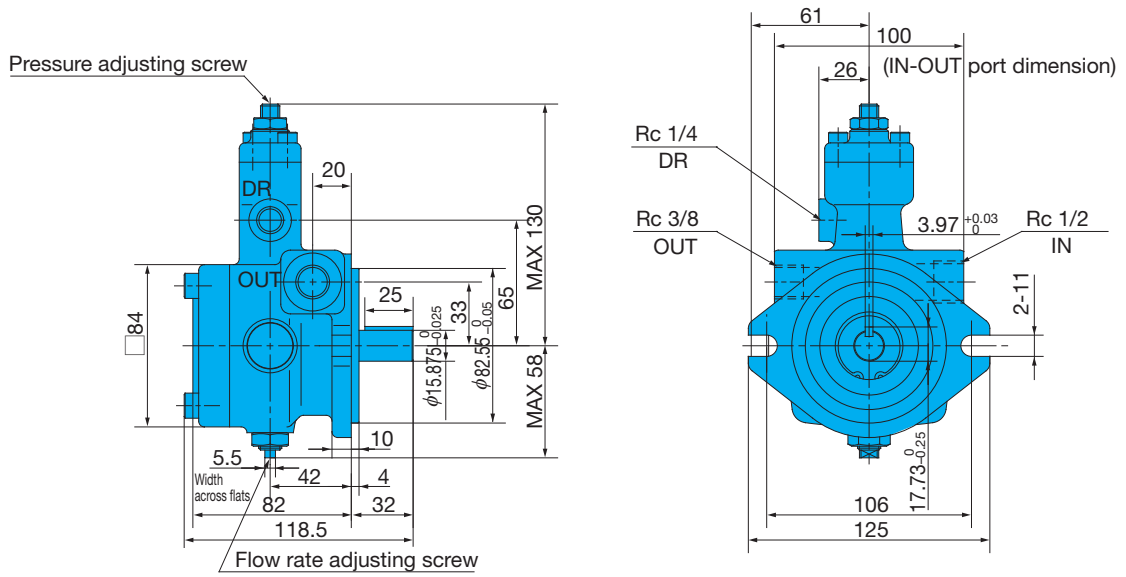
Foot Mounting Type



Note) Foot Mounting Kit: IHM-2-10

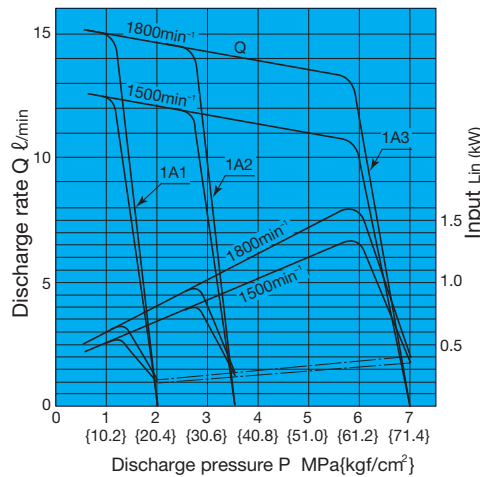
VDS-0B-1A*-10

Flange Mounting

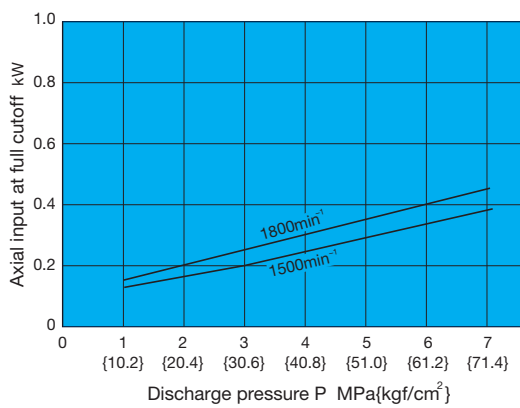


Performance Curves

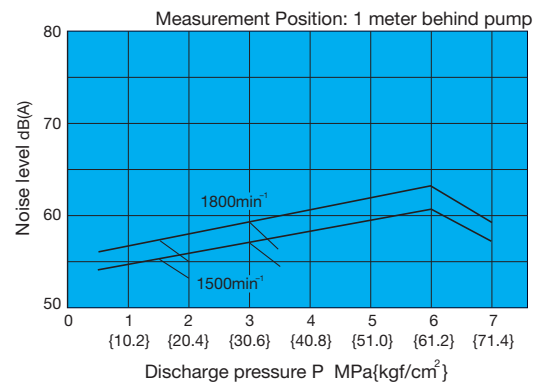
Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s



Axial Input At Full Cutoff

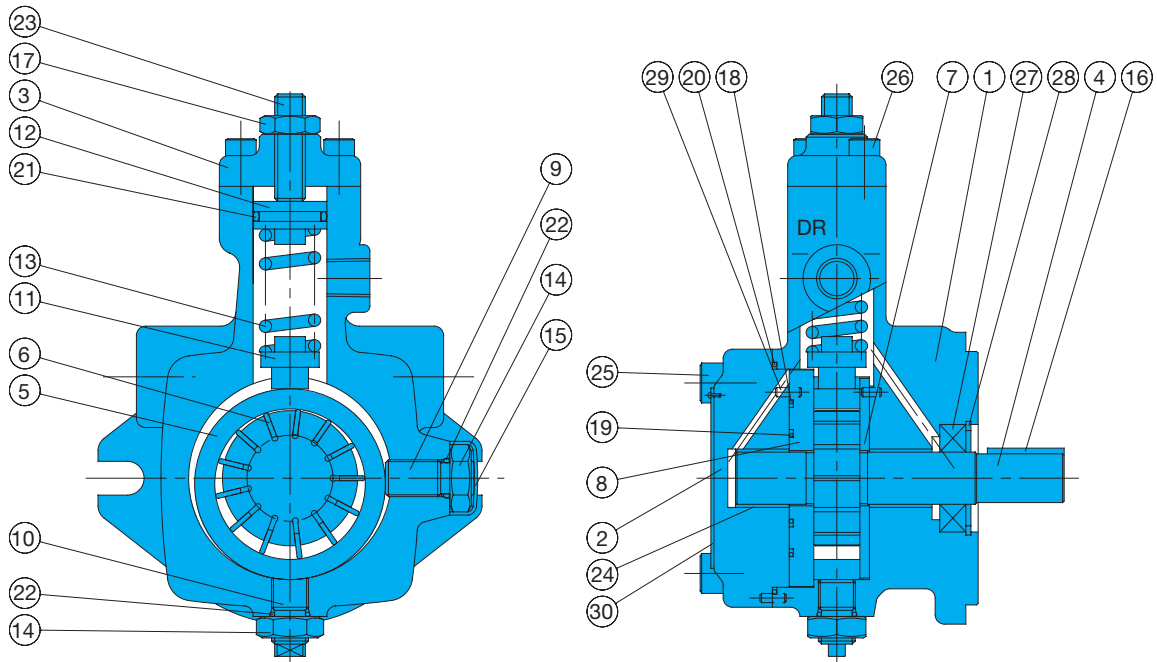


Noise Characteristics



Cross-sectional Drawings

VDS-0B-1A*-10



List of Sealing Parts

Seal Kit: VBAS-100B00

Applicable Pump Model: VDS-0A/B-1A*-10

Part No.	Part Name	Part Number	Q'ty
18	O-ring	AS568-023(NBR-90)	1
19	O-ring	AS568-032(NBR-90)	1
20	O-ring	S-71	1
21	O-ring	NBR-70-1 P20	1
22	O-ring	NBR-70-1 P10	2
27	Oil seal	TC-17358-V	1

Note) 1.Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).

2.The materials and hardness of the O-ring conform with JIS B2401.

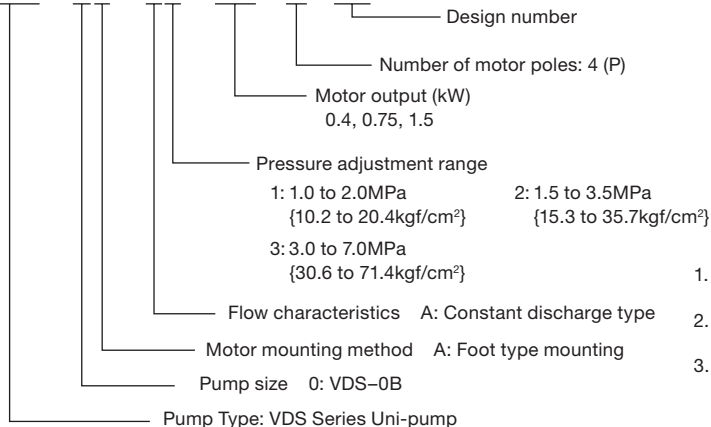
Part No.	Part Name	Part No.	Part Name
1	Body	16	Key
2	Cover (A)	17	Nut
3	Cover (B)	18	O-ring
4	Shaft	19	O-ring
5	Cam ring	20	O-ring
6	Vane	21	O-ring
7	Plate (S)	22	O-ring
8	Plate (H)	23	Screw
9	Thrust screw	24	Bearing
10	Screw	25	Screw
11	Piston	26	Screw
12	Holder	27	Oil seal
13	Spring	28	Snap ring
14	Nut	29	Pin
15	Cap	30	Nameplate

Uni-pump Specifications

(CE mark standard compliant)

Understanding Model Numbers

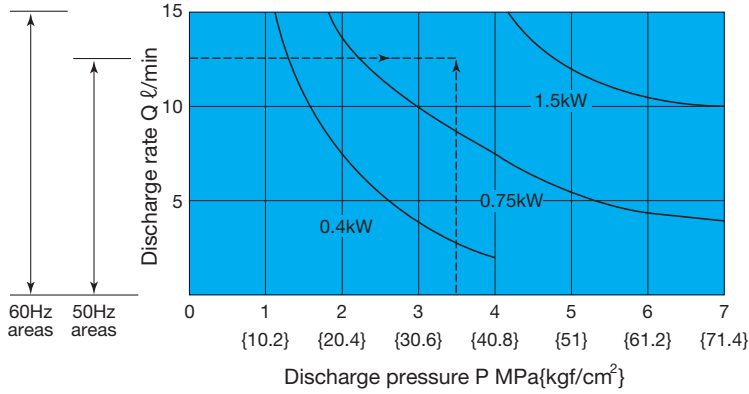
USV - 0A - A3 - 1.5 - 4 - 30



Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	
	50Hz	60Hz
7 {71.4}	12.5	15

- Standard drive motor is the fully enclosed fan-cooled E type (0.4kW) and F type (0.75, 1.5kW).
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
- Standard terminal box is B terminal (right side viewed from pump).

Motor Selection Curves



●How to select a motor

The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

Example:

To find the motor that can produce pressure of 3.5MPa and a discharge rate of 12.5 l/min.

Selection Process

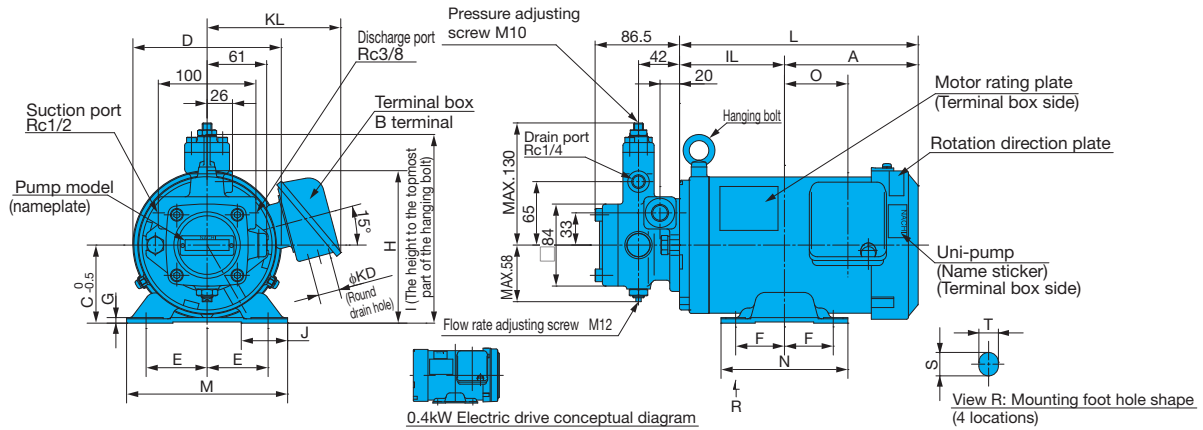
Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 12.5 l/min intersect in the area under the 1.5kW curve, it means that a 1.5kW motor should be used.

* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.

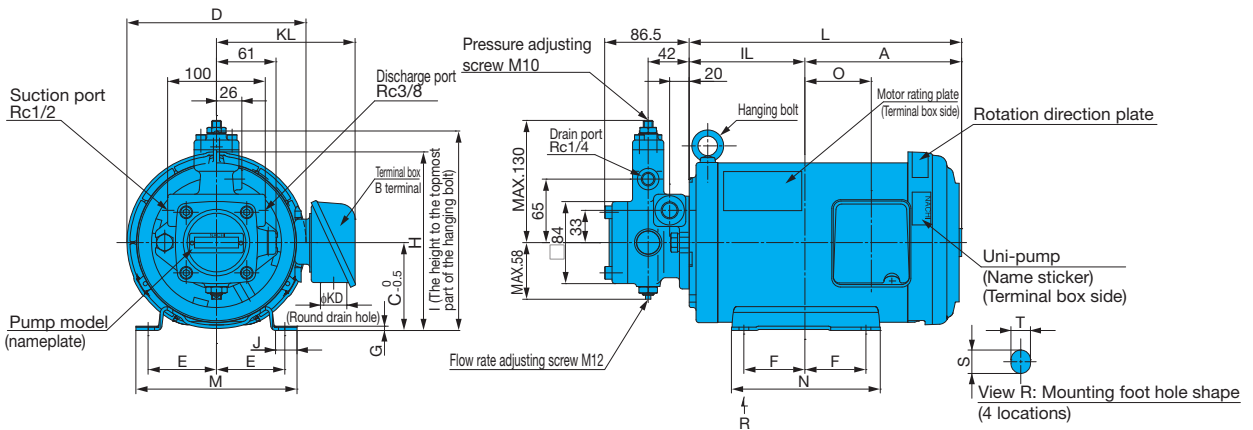
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed. 0.4kW is not changed from IE 1.

Installation Dimension Drawings

USV-0A-A*-0.4-4-30
0.75-4-30



USV-0A-A*-1.5-4-30



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I	J	L	M	N	S×T	φ KD	KL	O			
USV-0A-A1-0.4-4-30	113	107.5	71	139.5	56	45	4	141	-	42	220.5	150	115	20×7	27	132	43.5	71M	0.4	15.5
USV-0A-A2-0.4-4-30																				
USV-0A-A3-0.4-4-30																				
USV-0A-A1-0.75-4-30	137	107.5	80	152	62.5	50	4.5	160	193	47.5	244.5	165	130	25×10	27	137	65	80M	0.75	23.5
USV-0A-A2-0.75-4-30																				
USV-0A-A3-0.75-4-30																				
USV-0A-A3-1.5-4-30	160.5	118.5	90	183	70	62.5	4.4	183	204	22	279	165	152.5	16×10	27	142	68	90L	1.5	26.5

* See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

* The 0.4kW drive motor does not have hanging bolts.



VDR22 Design Series Variable Volume Vane Pump

30ℓ/min 14MPa
40ℓ/min 7MPa

Features

① Stable, highly efficient operation up to 14MPa

A biased piston that minimizes ring vibration and leak-free pressure balance construction enables highly efficient highpressure operation, and very stable performance up to 14MPa.

② High-precision instantaneous response

Response has been improved by a special bias piston mechanism. Prompt response at both ON-OFF and OFF-ON ensures instantaneous, stable,

high-precision operation.

③ Silent operation, even in the high pressure range

Quiet journal bearings, a bias piston that allows a 3-point support system, and new suction and discharge port shapes all contribute to minimize operation noise. Silent, vibration-free operation is ensured, even in the high pressure range.

④ Reduced power loss

A combination of NACHI-original mechanical innovations and precision machining create a pump that minimizes power loss, especially at full cutoff.

⑤ Solid construction stands up to harsh operating conditions

The tough and rugged construction of this pump is made possible by a long history of quality pump designs. This, in combination with specially selected materials and skilled workmanship, provides outstanding durability.

Specifications

Single Pump

Model No.	Capacity cm ³ /rev	No-load Discharge Rate ℓ/min				Pressure Adjustment Range MPa(kgf/cm ²)	Allowable Peak Pressure MPa(kgf/cm ²)	Revolution Speedmin ⁻¹		Weight kg
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
VDR-1A(B)-1A2-22 1A3 1A4 1A5	16.7	16.7	20	25	30	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4} 6.5 to 10.5 {66.3 to 107} 9 to 14 {91.8 to 143}	14 {143} 21 {214}	800	1800	9
VDR-1A(B)-2A2-22 2A3	22	22	27	33	40	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4}	14 {143}	800	1800	9

Double Pump

Model No.	Vent Side		Shaft Side		Vent Side	Shaft Side	Revolution Speedmin ⁻¹		Weight kg
	Discharge Rate ℓ/min	Pressure Adjustment Range MPa(kgf/cm ²)	Discharge Rate ℓ/min	Pressure Adjustment Range MPa(kgf/cm ²)			Min.	Max.	
VDR-11A(B)-1A2-1A2-22 VDR-11A(B)-1A2-1A3-22	30	1.5 to 3.5 {15.3 to 35.7}	30	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4}	14 {143}	800	1800	17	
VDR-11A(B)-1A3-1A3-22		3 to 7 {30.6 to 71.4}		3 to 7 {30.6 to 71.4}					
VDR-11A(B)-2A2-2A2-22 VDR-11A(B)-2A2-2A3-22	40	1.5 to 3.5 {15.3 to 35.7}	40	1.5 to 3.5 {15.3 to 35.7} 3 to 7 {30.6 to 71.4}	14 {143}	800	1800	17	
VDR-11A(B)-2A3-2A3-22		3 to 7 {30.6 to 71.4}		3 to 7 {30.6 to 71.4}					

Note) 1. The discharge rate is the value at 1800min⁻¹ no-load.

2. The change from design number 21 to design number 22 represents a change in the shaft key width from 3.2mm to 4.76mm. This means that when using a 3.2mm key coupling, you need to use a stepped key (VD31J-301000) or add a new key groove at 4.76.

● Handling

① Rotation Direction

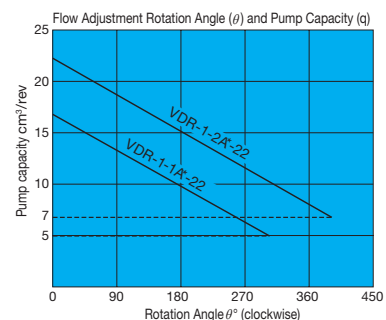
The direction of rotation is always clockwise (rightward) when viewed from the shaft side.

② Drain

Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 0.03MPa. When using a pump that has drain ports at two locations, use the drain port that is higher after the pump is installed.

③ Discharge Volume Adjustment

The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The graph on the right provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.



(Continued on following page)

However: $Q=q \times n \times 10^{-3}$

Q : No-load Discharge Rate Q ℓ/min

q : Volume cm³/rev

N : Revolution Speed min⁻¹

The broken line shows the flow volume adjustment range lower limit value.

Note) The values indicated above are at maximum discharge volume with the flow volume adjusting screw at the 0° position.

4 Pressure Adjustment

Pressure is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation.

5 Factory Default P-Q Settings (Standard Model)

- Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
- Pressure Setting = Pressure shown in table to the right

6 Thrust Screw

The thrust screw is precisely adjusted at the factory during assembly. Never touch the thrust screw. See callout ② in the crosssection diagram on page B-11.

7 Initial Operation

Before operating the pump for the first time, put the pump discharge

Factory Default Pressure Settings MPa(kgf/cm ²)
2 : 3.5{35.7}
3 : 3 {30.6}
4 : 6.5{66.3}
5 : 9 {91.8}

side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit.

Provide an air bleed valve in circuits where it is difficult to bleed air before startup.

8 Sub Plate

Use the following table for specification when a sub plate is required.

For detailed dimensions, see pages B-17 through B-19.

Pump Model No.	Sub Plate Number	Motor(kW)
VDR-1A-1A*-22	MVD-1-115-10	0.75 to 1.5
	MVD-1-135-10	2.2 to 3.7
VDR-1A-2A*-22	MVD-1-115Y-10	0.75 to 1.5
	MVD-1-135Y-10	2.2 to 3.7
VDR-11A-*A* -*A*-22	MVD-11-135-10	1.5 to 3.7
	MVD-11-135X-10	

9) For the hydraulic operating fluid, use type ISO VG32 or equivalent (viscosity index of at least 90) for pressures of 7MPa or lower, and type ISO VG68 or equivalent (viscosity index of at least 90) for pressures greater than 7MP.

10) The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

11) Suction pressure is -0.03 to +0.03MPa (-0.3 to +0.3kgf/cm²), and the suction port flow rate should be to greater than 2m/sec.

12) Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.

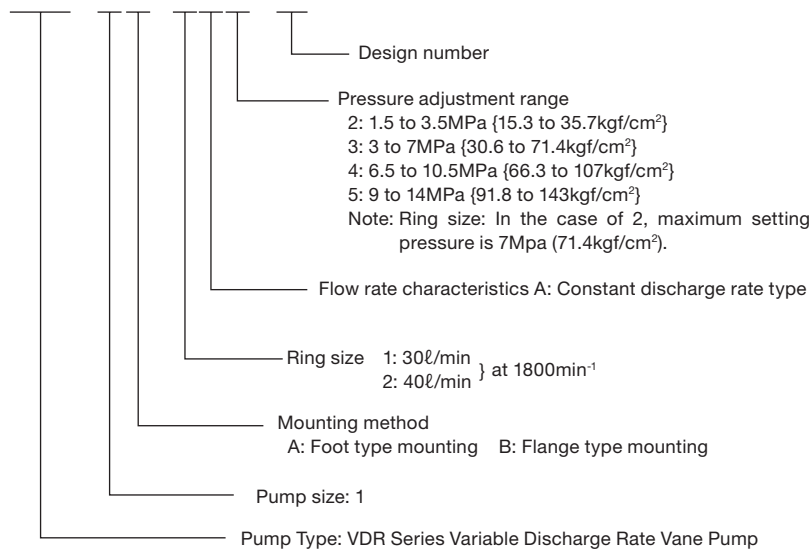
13) Provide a suction strainer with a filtering grade of about 100 μm (150 mesh). For the return line to the tank, use a 25μm line filter.

(Continued on following page)

Explanation of model No.

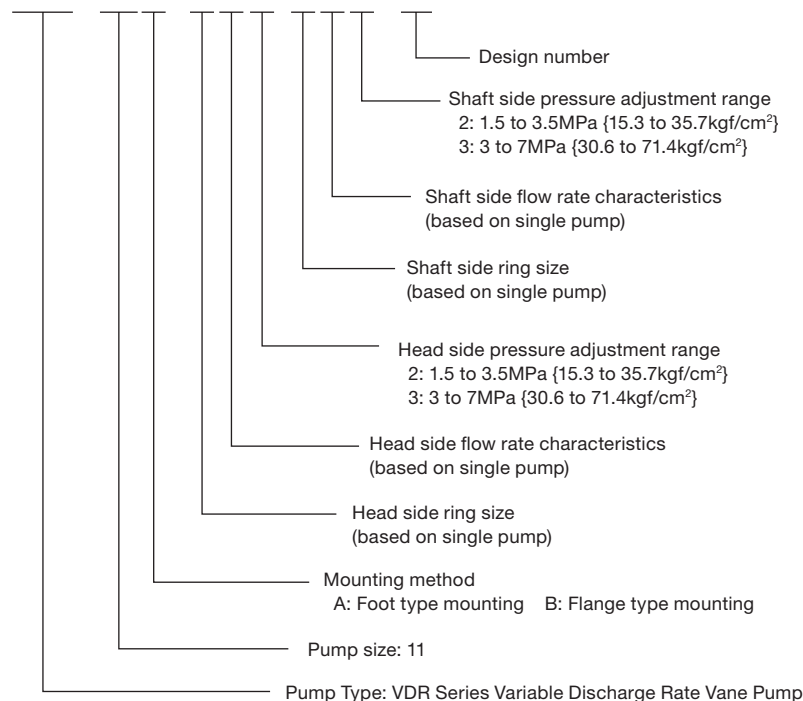
Single pump

VDR - 1 A - 1 A 2 - 22



Double pump

VDR - 11 A - 1 A 2 - 1 A 3 - 22



- 14 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water or other foreign matter, and watch out for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 15 Contact your agent about using water and glycol-based hydraulic operating fluids.
- 16 At startup, repeat the inching operation (start-stop) to prime the pump

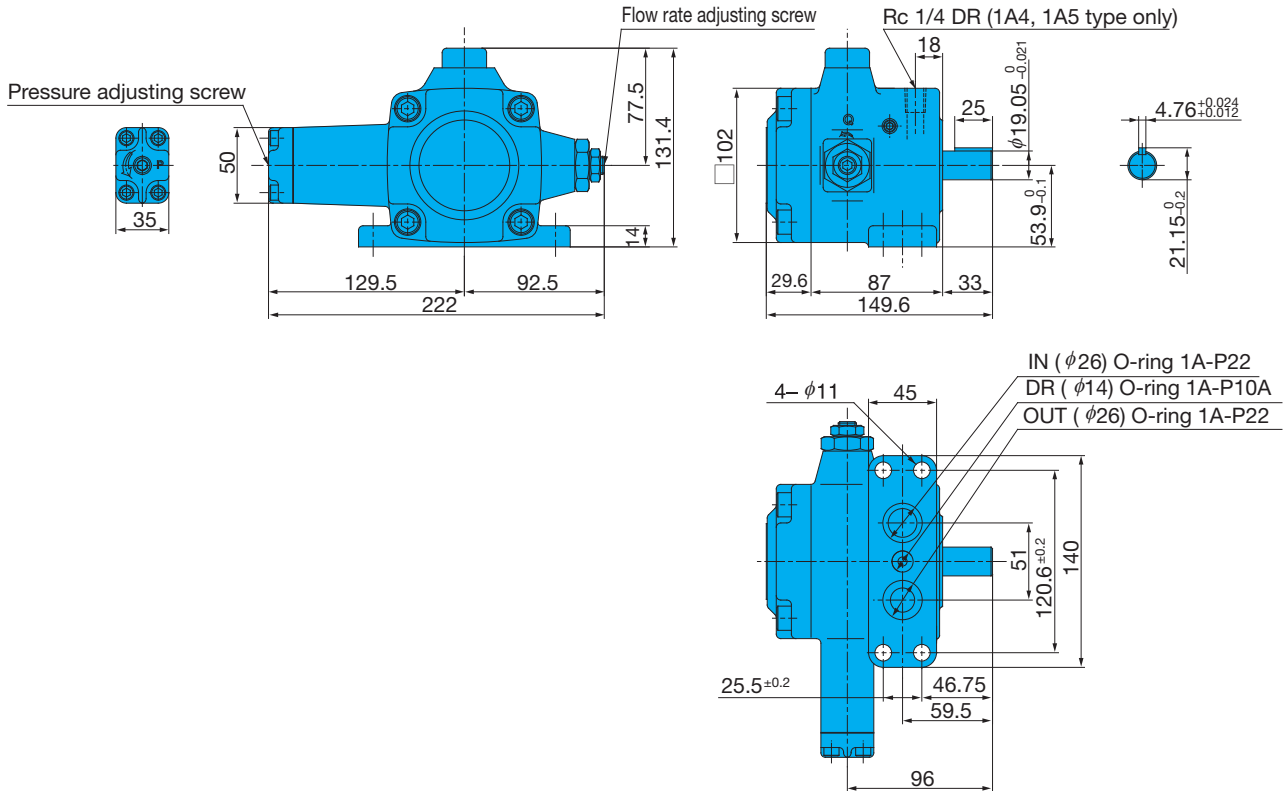
- and bleed air from the pump and pipes. (This pump has no fluid supply port.)
- 17 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 18 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. Use a pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.

● Inverter Drive Precautions

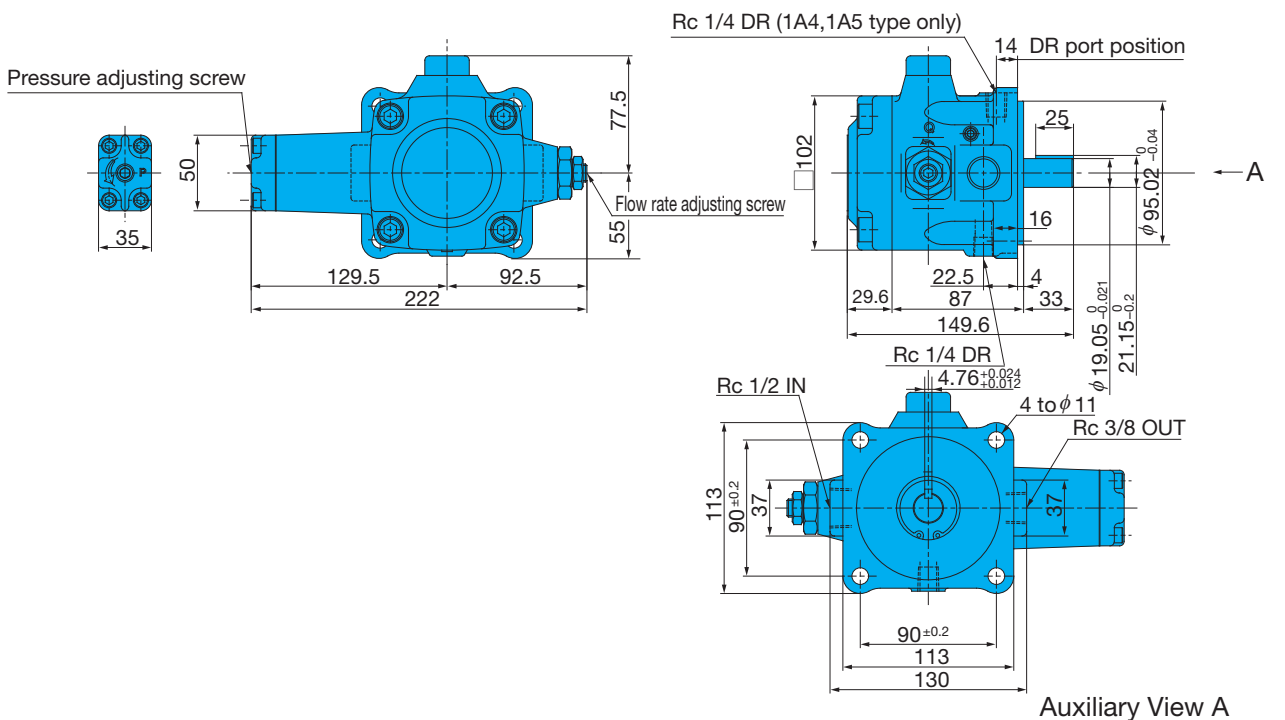
- 1 Set the revolution speed within the range of the pump specification revolution speed.
- 2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Installation Dimension Drawings

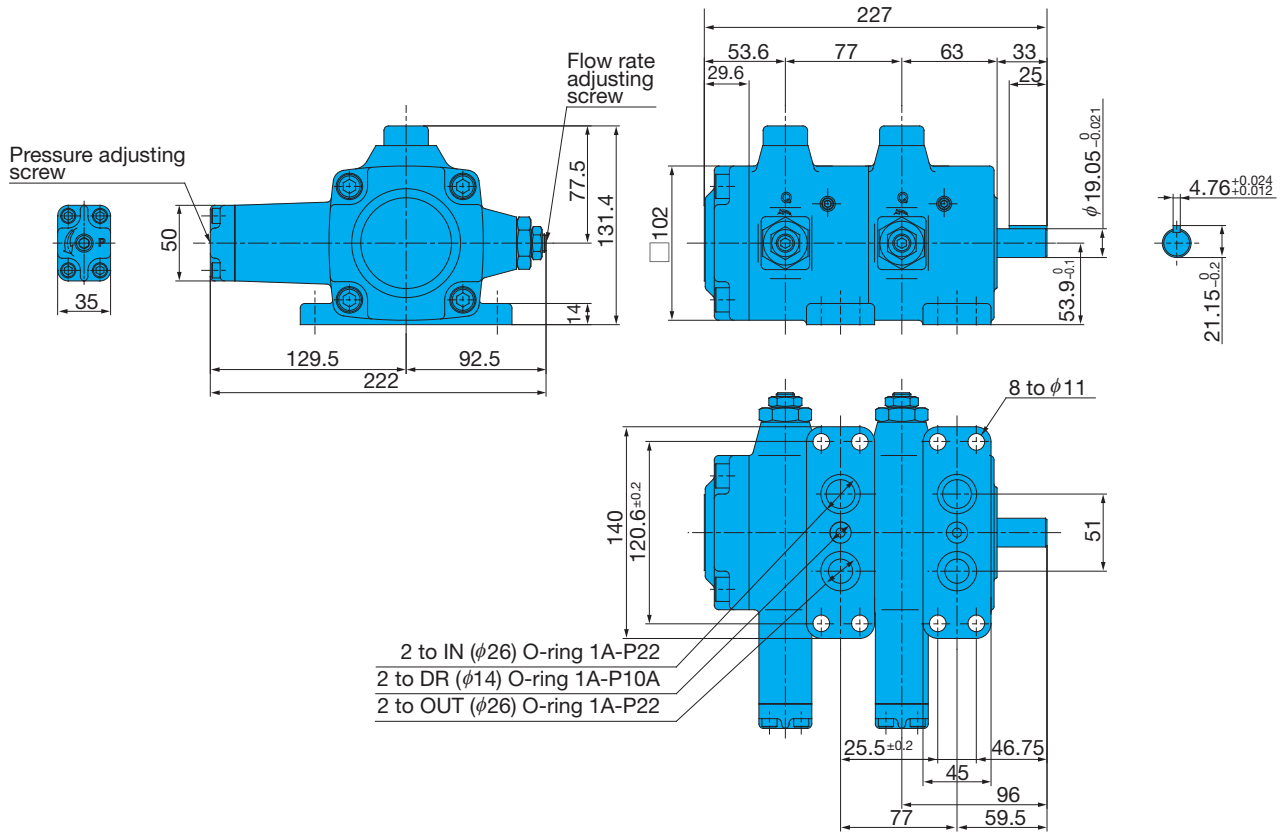
VDR-1A-*A*-22



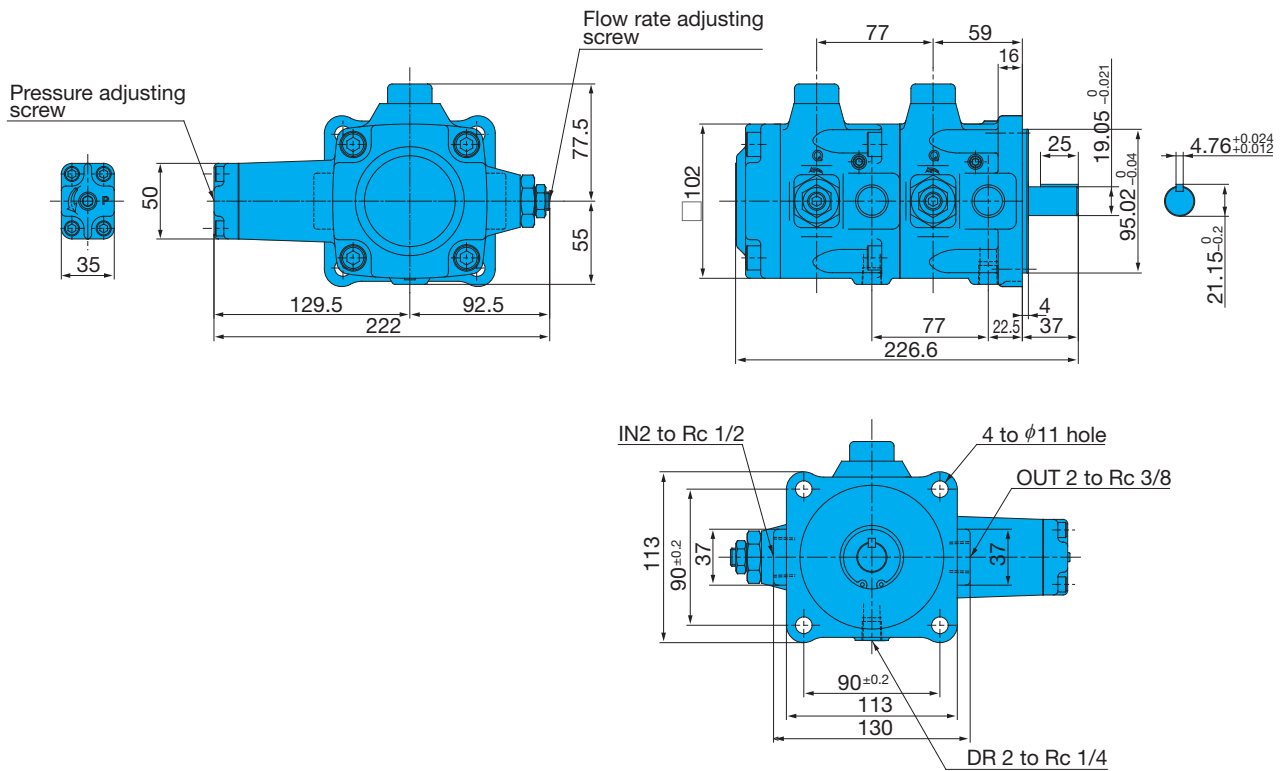
VDR-1B-*A*-22



VDR-11A-*-*-22



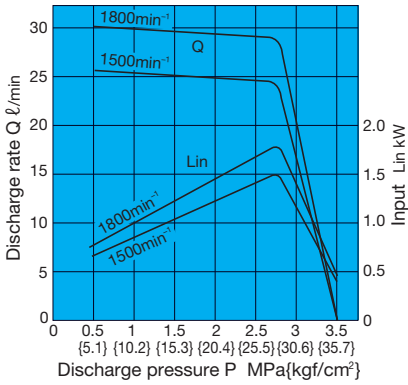
VDR-11B-*-*-22



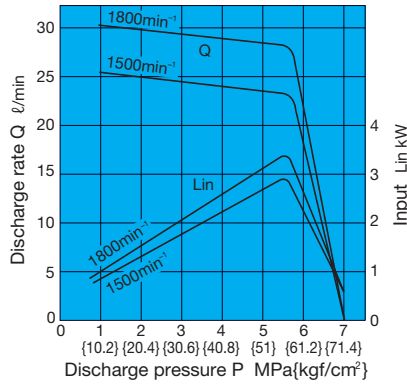
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

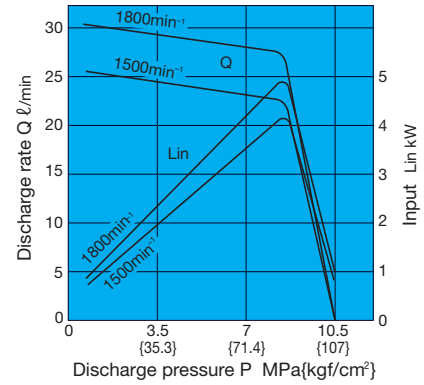
VDR-1*-1A2-22



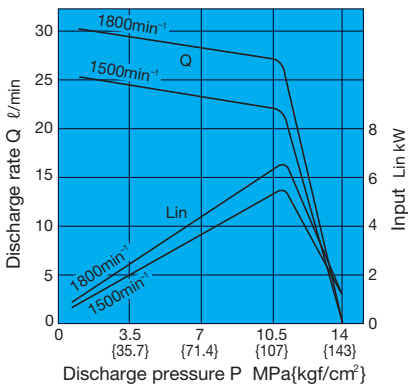
VDR-1*-1A3-22



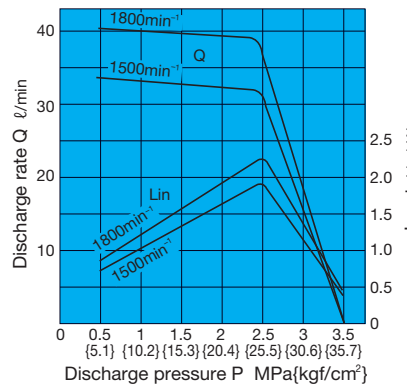
VDR-1*-1A4-22



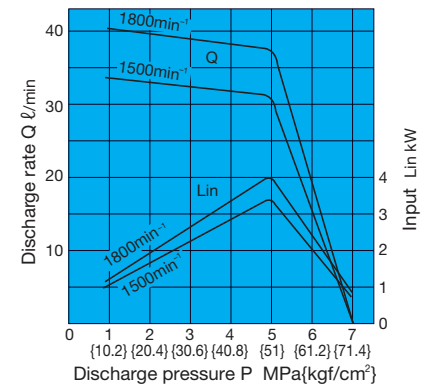
VDR-1*-1A5-22



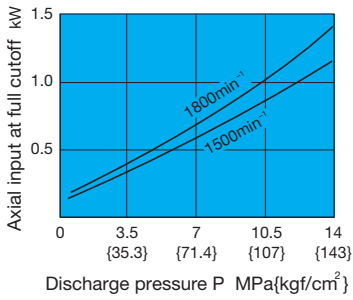
VDR-1*-2A2-22



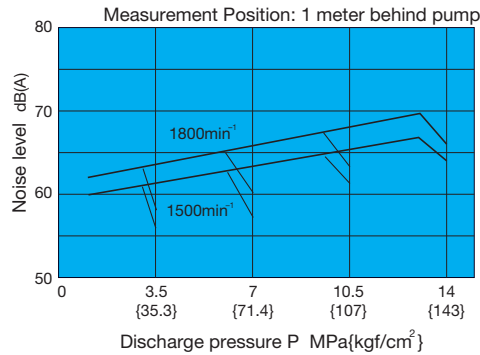
VDR-1*-2A3-22



Axial Input At Full Cutoff

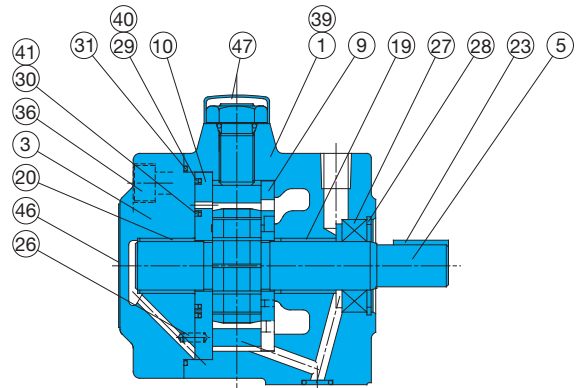
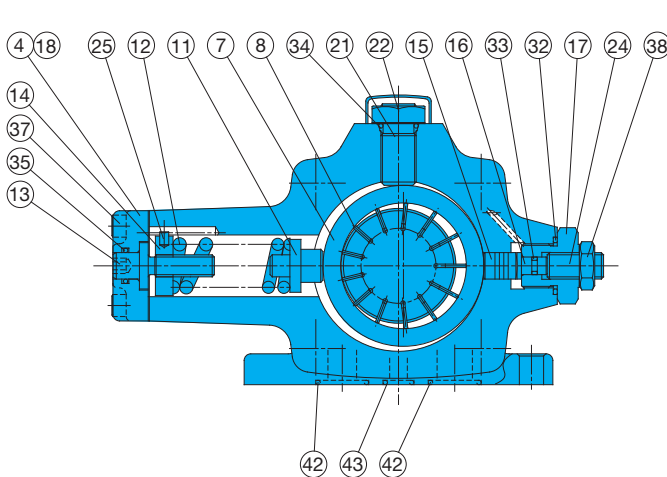


Noise Characteristics



Cross-sectional Drawings

VDR-1A-*A*-22



List of Sealing Parts

Single Pump

Part No.	Applicable Pump Model No. VDR-1A-*A*-22		
	Seal Kit Number VDBS-101A00		
	Part Name	Part Number	Q'ty
18	Packing	VDB32-101000	1
27	Oil seal	ISP1D-224211F	1
29	Backup ring	VDB34-101000	1
30	Backup ring	VDB34-201000	1
31	O-ring	S85(NOK)	1
32	O-ring	NBR-70-1 P22	1
33	O-ring	NBR-70-1 P5	1
34	O-ring	NBR-70-1 P14	1
35	O-ring	NBR-70-1 P12	1
40	O-ring	AS568-036	1
41	O-ring	AS568-029	1
42	O-ring	NBR-70-1 P22	2
43	O-ring	NBR-70-1 P10A	1

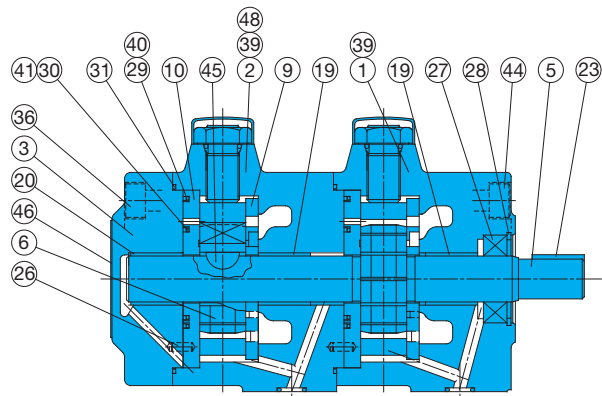
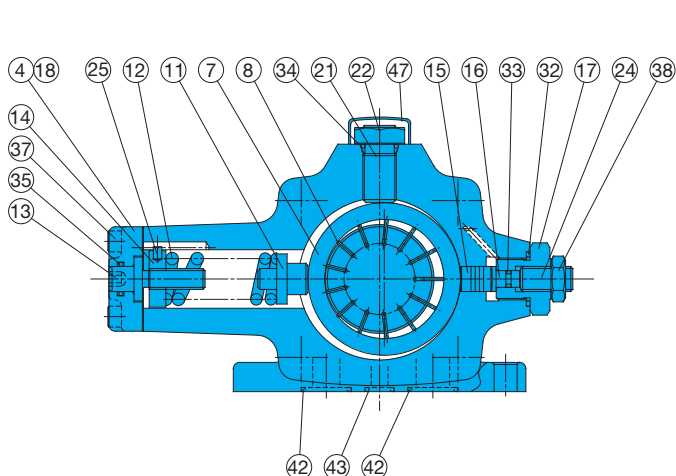
- Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
 2. The materials and hardness of the O-ring conform with JIS B2401.
 3. For VDR-1B-*A*-22, the seal kit number becomes VDBS-101B00, without the 42 and 43 O-rings.

Part No.	Part Name	Part No.	Part Name
1	Body (A)	25	Pin
2	Body (B)	26	Spring pin
3	Cover	27	Oil seal
4	Cover	28	Snap ring
5	Shaft	29	Backup ring
6	Rotor	30	Backup ring
7	Ring	31	O-ring
8	Vane	32	O-ring
9	Plate (S)	33	O-ring
10	Plate (H)	34	O-ring
11	Piston	35	O-ring
12	Spring	36	Screw
13	Screw	37	Screw
14	Nut	38	Nut
15	Piston	39	Plug
16	Holder	40	O-ring
17	Adapter	41	O-ring
18	Packing	42	O-ring
19	Bearing (S)	43	O-ring
20	Bearing (H)	44	Screw
21	Thrust screw	45	Key
22	Nut	46	Nameplate
23	Key	47	Cap
24	Screw	48	Pin

Double Pump

Part No.	Applicable Pump Model No. VDR-11A-*A*-22		
	Seal Kit Number VDBS-111A00		
	Part Name	Part Number	Q'ty
18	Packing	VDB32-101000	2
27	Oil seal	ISP1D-224211F	1
29	Backup ring	VDB34-101000	2
30	Backup ring	VDB34-201000	2
31	O-ring	S85(NOK)	2
32	O-ring	NBR-70-1 P22	2
33	O-ring	NBR-70-1 P5	2
34	O-ring	NBR-70-1 P14	2
35	O-ring	NBR-70-1 P12	2
40	O-ring	AS568-036	2
41	O-ring	AS568-029	2
42	O-ring	NBR-70-1 P22	4
43	O-ring	NBR-70-1 P10A	2

- Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
 2. The materials and hardness of the O-ring conform with JIS B2401.
 3. For VDR-11B-*A*-22, the seal kit number becomes VDBS-111B00, without the 42 and 43 O-rings.



Uni-pump Specifications

(CE mark standard compliant)

Understanding Model Numbers

Single Pump

UVD -1 A - 2 A 2 - 1.5 - 4 - 60

- Design number
- Number of motor poles: 4 (P)
- Motor output (kW)
0.75, 1.5, 2.2, 3.7
- Pressure adjustment range
2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
3: 3.0 to 7.0MPa {30.6 to 71.4kgf/cm²}
- Flow characteristics A: Constant discharge type
- Ring size
None : 30ℓ/min } at 1800min⁻¹
2 : 40ℓ/min }
- A: Foot type mounting
- Pump size 1: VDR-1B (22D)
- Pump Type: VDR (22D) Series Uni-pump

Double Pump

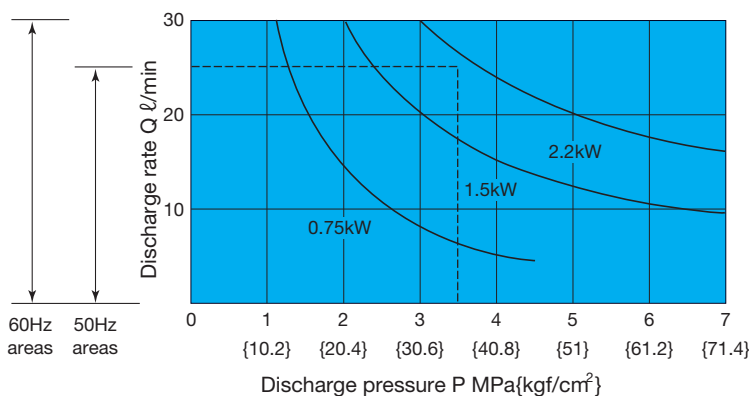
UVD - 11 A - 2 A 2 - 2 A 2 - 3.7 - 4 - 60

- Design number
- Number of motor poles: 4 (P)
- Motor output (kW)
1.5, 2.2, 3.7
- Shaft side pump pressure adjustment range
2: 1.5 to 3.5MPa {15.3 to 35.7kgf/cm²}
3: 3.0 to 7.0MPa {30.6 to 71.4kgf/cm²}
- Shaft side pump flow rate characteristics
A: Constant discharge type
- Shaft side pump ring size
None: 30ℓ/min } at 1800min⁻¹
2 : 40ℓ/min }
- Head side pump pressure adjustment range:
Same as the shaft side pump
- Head side pump flow rate characteristics
A: Constant discharge type
- Head side pump ring size
None: 30ℓ/min } at 1800min⁻¹
2 : 40ℓ/min }
- A: Foot type mounting
- Pump size 11: VDR-11B (22D)
- Pump Type: VDR (22D) Series Uni-pump

Specifications

Model No.	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min (A*)		Maximum Flow Rate ℓ/min (2A*)	
		50Hz	60Hz	50Hz	60Hz
UVD-1A	7 {71.4}	25	30	33	39
UVD-11A	7 {71.4}	25-25	30-30	33-33	39-39

Motor selection curves



● Selecting a motor

The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

Example:

To find the motor that can produce pressure of 3.5MPa and a discharge rate of 25l/min.

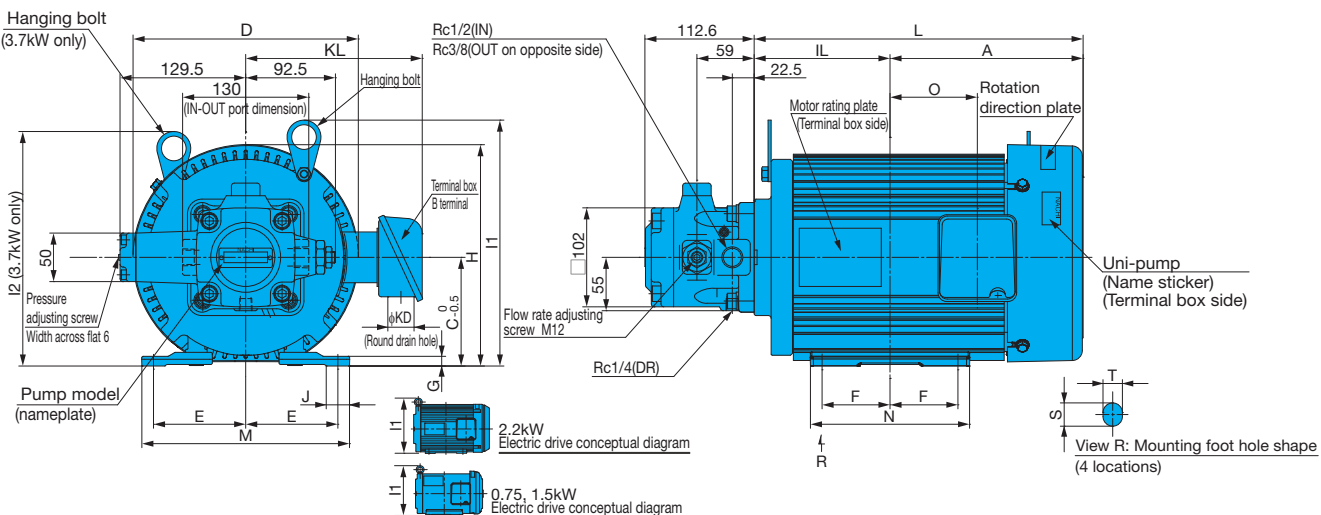
Selection Process

Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 25l/min intersect in the area under the 2.2kW curve, it means that a 2.2kW motor should be used. In the case of a double pump configuration, select a motor that is larger than the total power req'd by both pumps.

- * Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.
- * When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Installation Dimension Drawings

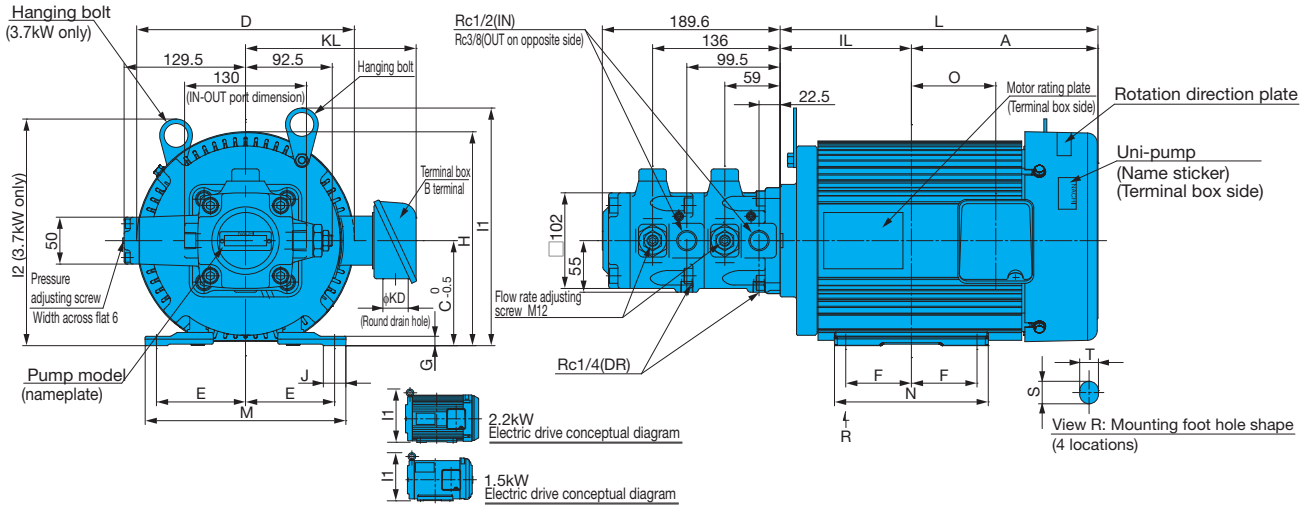
UVD-1A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg		
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL				O	
UVD-1A-A2-0.75-4-60	137	105	80	152	62.5	50	4.5	160	193	-	47.5	242	165	130	25x10	27	137	65	80M	0.75	28	
UVD-1A-A2-1.5-4-60																						
UVD-1A-A3-1.5-4-60	160.5	118.5	90	183	70	62.5	4.4	183	204	-	22	279	165	152.5	16x10	27	142	68	90L	1.5	31	
UVD-1A-2A2-1.5-4-60																						
UVD-1A-A2-2.2-4-60																						
UVD-1A-A3-2.2-4-60	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	45	
UVD-1A-2A2-2.2-4-60																						
UVD-1A-A3-3.7-4-60																						
UVD-1A-2A2-3.7-4-60	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	49	
UVD-1A-2A3-3.7-4-60																						

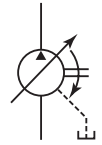
1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

UVD-11A



Uni-pump	Motor Dimensions [mm]																		Frame No.	Output kW (4 poles)	Weight kg	
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	SxT	φ KD	KL	O				
UVD-11A-A2-A2-1.5-4-60																						
UVD-11A-A2-A3-1.5-4-60	160.5	118.5	90	183	70	62.5	4.4	183	204	-	22	279	165	152.5	16x10	27	142	68	90L	1.5	39	
UVD-11A-A3-A3-1.5-4-60																						
UVD-11A-A2-A2-2.2-4-60																						
UVD-11A-A2-A3-2.2-4-60	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	53	
UVD-11A-A3-A3-2.2-4-60																						
UVD-11A-2A2-2A2-2.2-4-60																						
UVD-11A-A2-A2-3.7-4-60																						
UVD-11A-A2-A3-3.7-4-60																						
UVD-11A-A3-A3-3.7-4-60	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	57	
UVD-11A-2A2-2A2-3.7-4-60																						
UVD-11A-2A2-2A3-3.7-4-60																						

1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).



VDR13 Design Series Variable Volume Vane Pump

20 to 45ℓ/min
6MPa

❖The new design number 13 was created by modifying some of the components of old design numbers 11 and 12, and the new design installation compatible with the old design.

Features

- ① Energy efficient, economical operation.
- ② Built-in high-precision temperature compensation mechanism.
- ③ The ring is displaced by a spring, and a rise in pressure automatically moves it to the center to make the discharge rate zero.
- ④ Relief valve and unloading valve can be eliminated from the circuit.
- ⑤ It was possible to reduce the size of the unit because there was no increase of proportional input to pressure which prevented increases in the temperature of the fluid.
- ⑥ New design for lower noise and improved durability.

Specifications

Single Pump

Model No.	Capacity cm ³ /rev	No-load Discharge Rate (ℓ/min)				Pressure Adjustment Range MPa{kgf/cm ² }	Allowable Peak Pressure MPa {kgf/cm ² }	Revolution Speed min ⁻¹		Weight kg
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
VDR-1A(B)-1A1-13	13.9	14	16.5	21	25	1 to 2 {10.2 to 20.6}	14 {143}	800	1800	8
-1A2-	13.9	14	16.5	21	25	1.5 to 3.5 {15.3 to 35.7}				
-1A3-	11.1	11	13	17	20	3 to 6 {30.6 to 61.2}				
VDR-2A(B)-1A1-13	25	25	30	38	45	1 to 2 {10.2 to 20.4}	14 {143}	800	1800	21
-1A2-	25	25	30	38	45	1.5 to 3.5 {15.3 to 35.7}				
-1A3-	22.2	22	26.5	34	40	3 to 6 {30.6 to 61.2}				

Double Pump

Model No.	Vent Side		Shaft Side		Vent Side	Shaft Side	Revolution Speed min ⁻¹		Weight kg
	Discharge Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Discharge Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Allowable Peak Pressure MPa{kgf/cm ² }	Min.	Max.		
VDR-11A(B)-1A1-1A1-13	25	1 to 2 {10.2 to 20.4}	25	1 to 2 {10.2 to 20.4}	14 {143}	800	1800	A : 13.6 B : 13.9	
VDR-11A(B)-1A1-1A2-13			20	1.5 to 3.5 {15.3 to 35.7}					
VDR-11A(B)-1A1-1A3-13		20	3 to 5 {30.6 to 51}						
VDR-11A(B)-1A2-1A2-13		1.5 to 3.5 {15.3 to 35.7}	25	1.5 to 3.5 {15.3 to 35.7}					
VDR-11A(B)-1A2-1A3-13			20	3 to 5 {30.6 to 51}					
VDR-11A(B)-1A3-1A3-13		20	3 to 5 {30.6 to 51}	20					3 to 5 {30.6 to 51}

Note) 1. The discharge rate is the value at 1800min⁻¹ no-load.

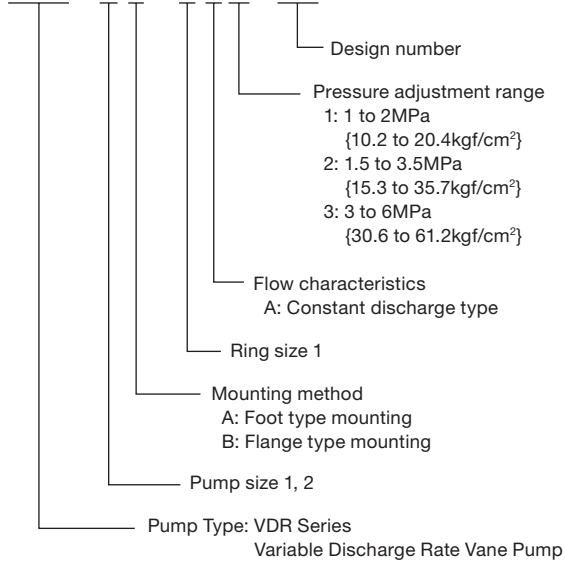
2. In addition to this model, the VDC Series (maximum working pressure: 14MPa) high-pressure variable vane pump is also available. See page B-25 for more information.
3. The change from VDR-1 Series design number 11 to design number 12 represents a change in the shaft key width from 3.2mm to 4.76mm. This means that when using a 3.2mm key coupling, you need to use a stepped key (VD31J-302000) or add a new key groove at 4.76.
4. There is no change in the mounting method with the change from the VDR-1 size design number 12 and VDR-2 design number 11 to design number 13.

Explanation of model No.

Single Pump

Single Pump

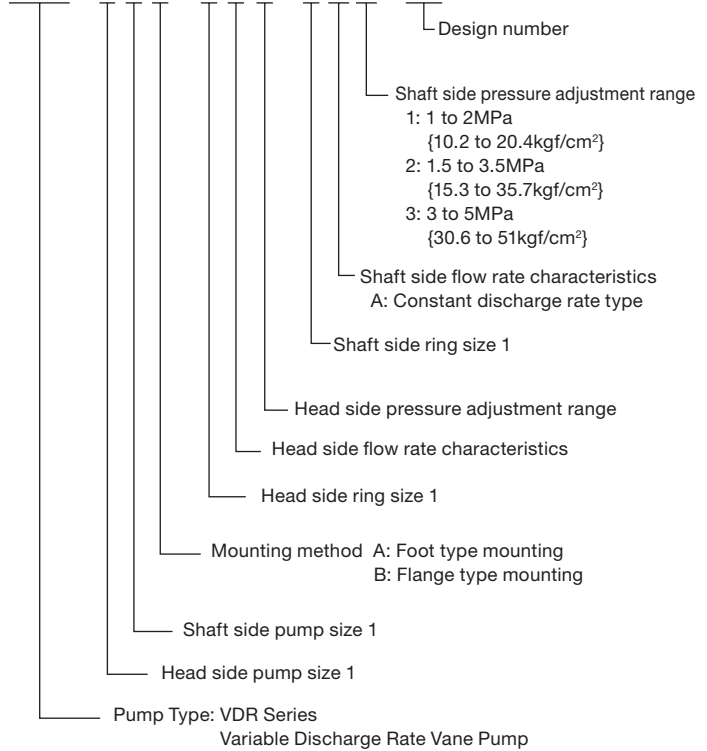
VDR - 1 A - 1 A 2 - 13



Double Pump

Double Pump

VDR - 1 1 A - 1 A 1 - 1 A 2 - 13



● Handling

1] Rotation Direction

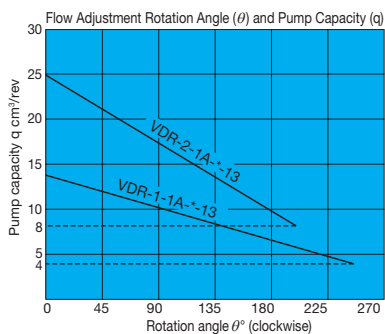
The direction of rotation is always clockwise (rightward) when viewed from the shaft side.

2] Drain

Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 0.03MPa.

3] Discharge Volume Adjustment

The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The graph below provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.



However:

Q : No-load Discharge Rate Q_L /min
 q : Volume cm^3/rev
 N : Revolution Speed min^{-1}

4] Pressure Adjustment

Pressure is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation.

5] Factory Default P-Q Settings (Standard Model)

- Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
- Pressure Setting = Pressure shown in table to the right

6] Initial Operation

Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit.

Note) The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken line shows the flow volume adjustment range lower limit value.

Factory Default Pressure Settings

MPa	{kgf/cm ² }
1 : 2	{20.4}
2 : 3.5	{35.7}
3 : 3	{30.6}

(Provide an air bleed valve in circuits where it is difficult to bleed air before startup.)

7] Sub Plate

When a sub plate is required, specify a sub-plate type from the table in the installation dimension diagram.

8] For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating fluid that provides kinematic viscosity during operation in the range of 20 to 150mm²/s.

9] The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure and low speed until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.

10] Suction pressure is -0.03 to +0.03MPa (-0.3 to +0.3kgf/cm²), and the suction port flow rate should be to greater than 2m/sec.

- 11 Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 12 Provide a suction strainer with a filtering grade of about 100 μ m (150 mesh). For the return line to the tank, use a 25 μ m line filter.
- 13 Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for discoloration. Whitish fluid indicates

- that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 14 At startup, repeat the inching operation (start-stop) to prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)
- 15 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.
- 16 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. Use a

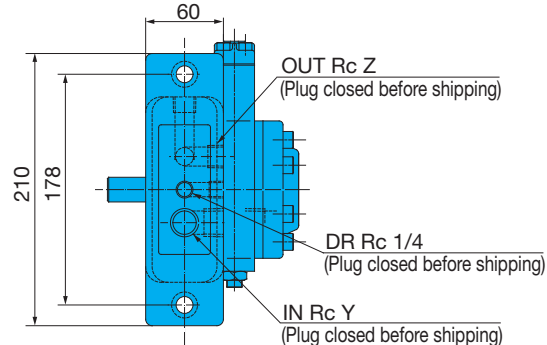
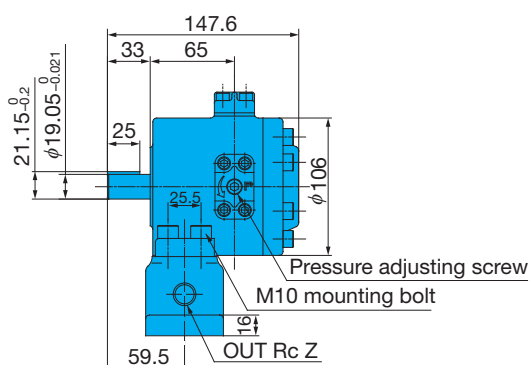
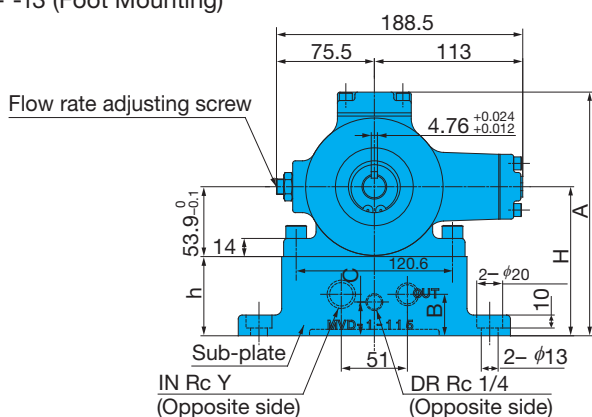
pump mounting base of sufficient rigidity. The angle error should be no greater than 1°.

● Inverter Drive Precautions

- 1 Set the revolution speed within the range of the pump specification revolution speed.
- 2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Installation Dimension Drawings

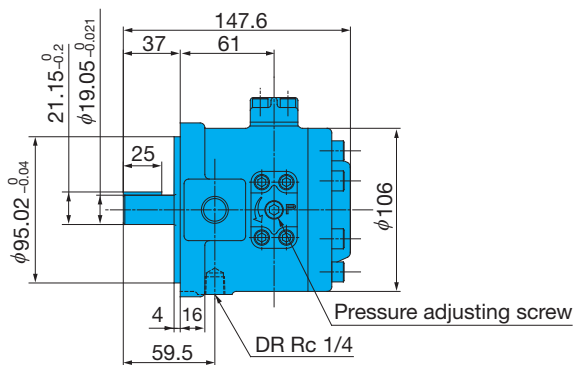
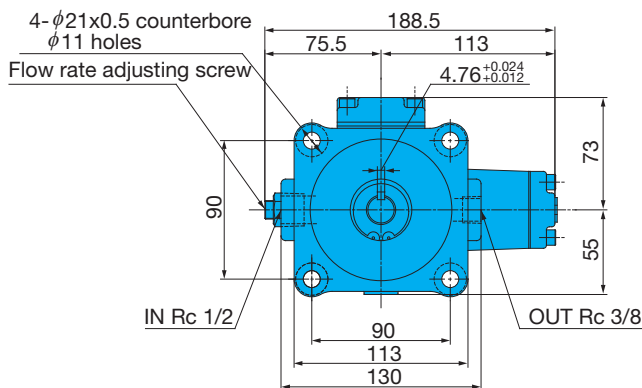
VDR-1A-* -13 (Foot Mounting)



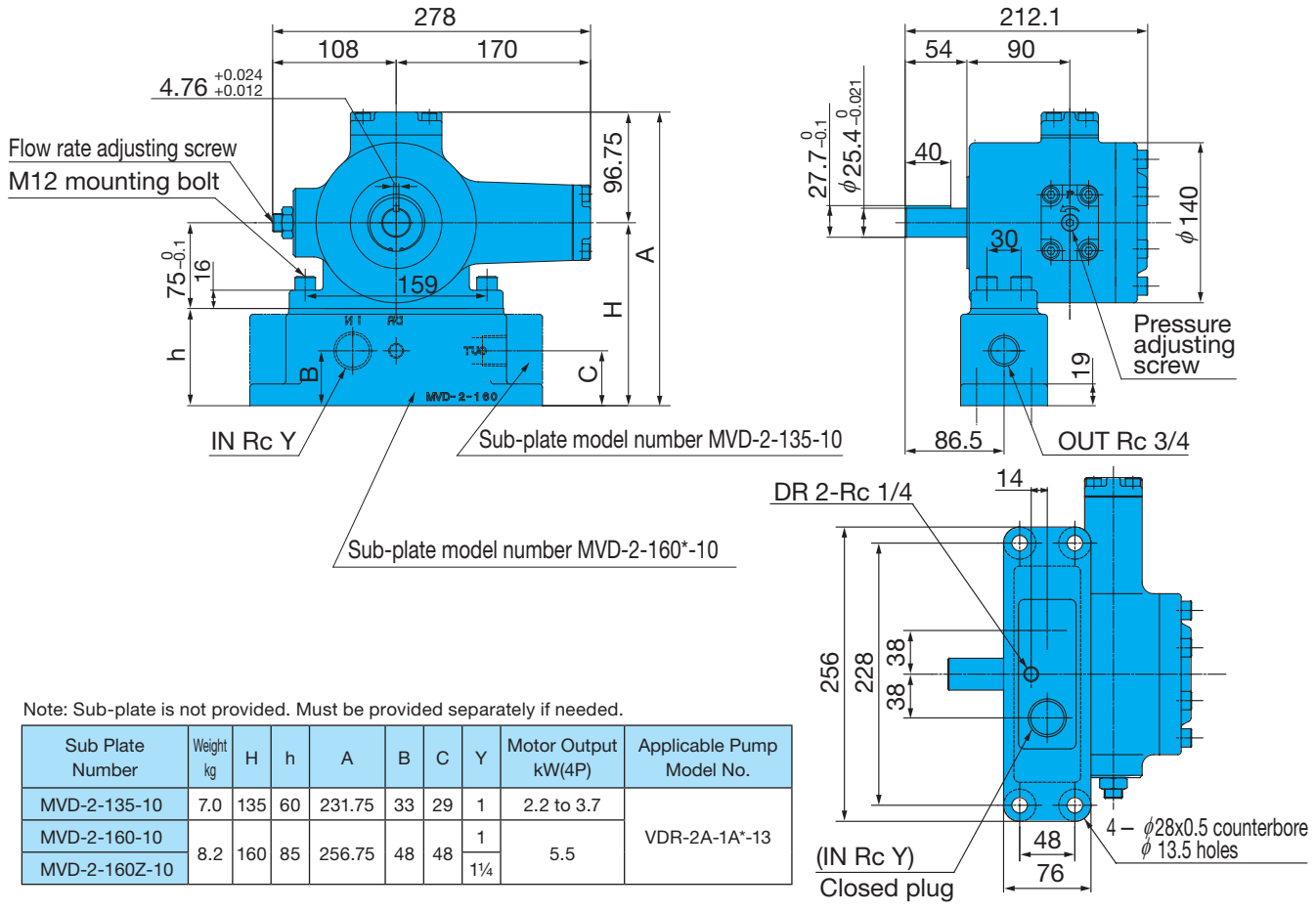
Note: Sub-plate is not provided. Must be provided separately if needed.

Sub Plate Number	Weight kg	H	h	A	B	C	Y	Z	Motor Output kW(4P)
MVD-1-115-10	3.7	115	61.1	188	32	26	1/2	3/8	0.75 to 1.5
MVD-1-115Y-10							3/4	1/2	
MVD-1-135-10	4.9	135	81.1	208	40	40	1/2	3/8	2.2 to 3.7
MVD-1-135Y-10							3/4	1/2	

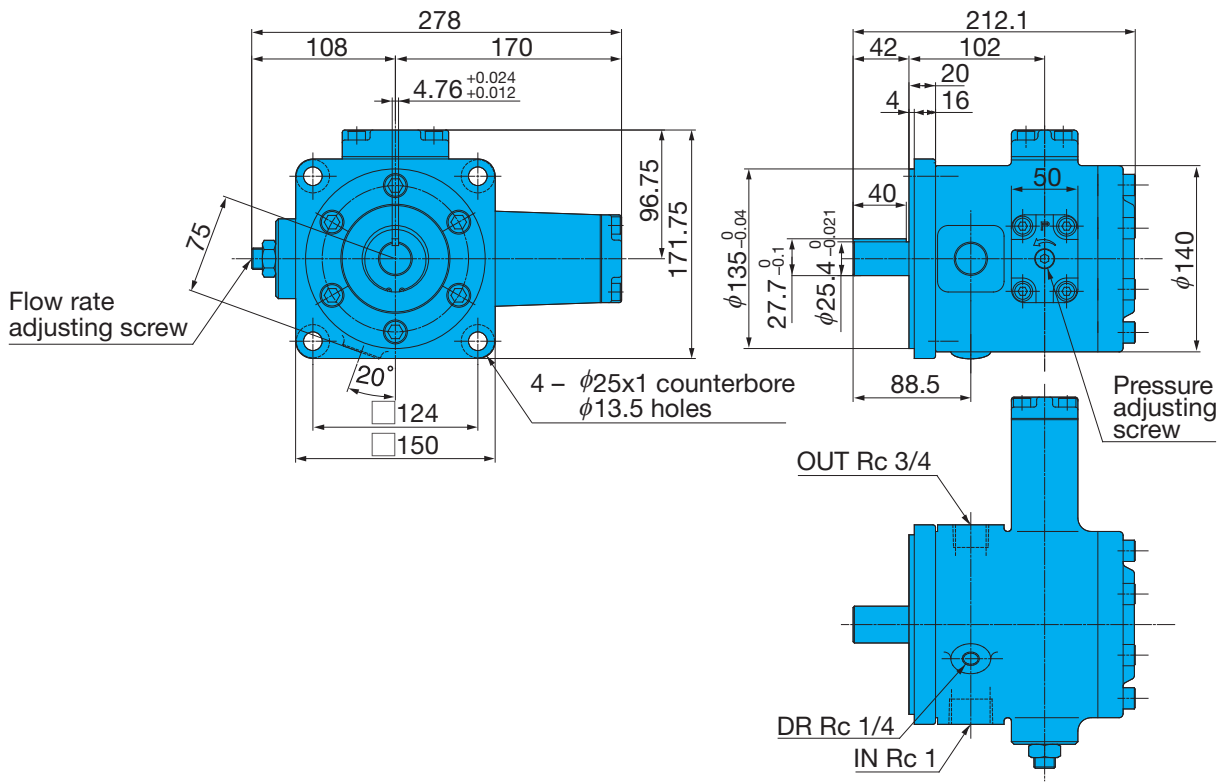
VDR-1B-* -13 (Flange Mounting)



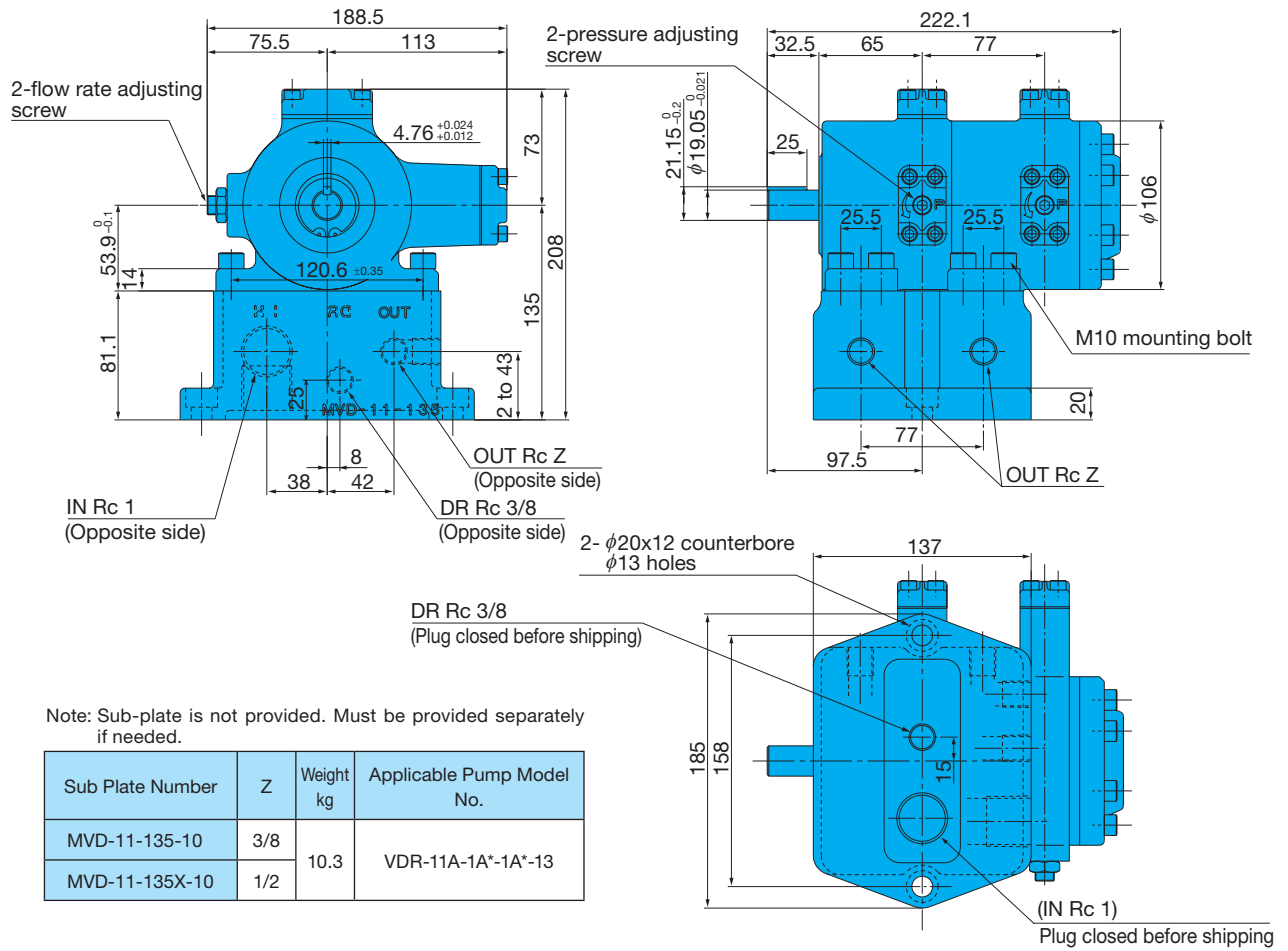
VDR-2A-*-13 (Foot Mounting)



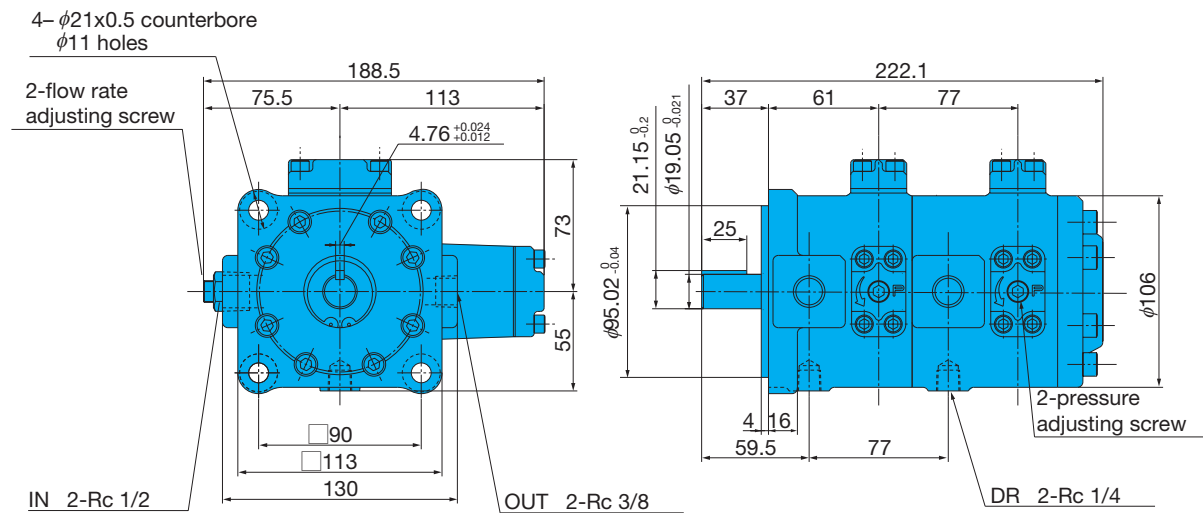
VDR-2B-*-13 (Flange Mounting)



VDR-11A-*⁻13 (Foot Mounting)



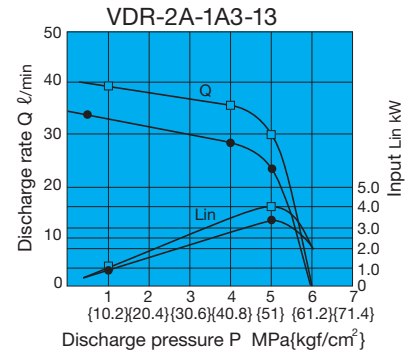
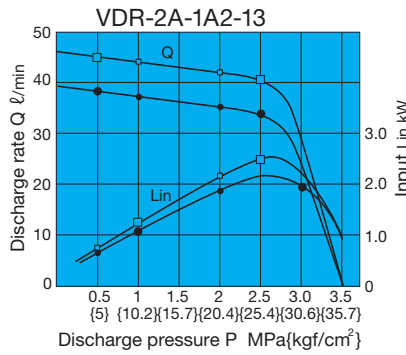
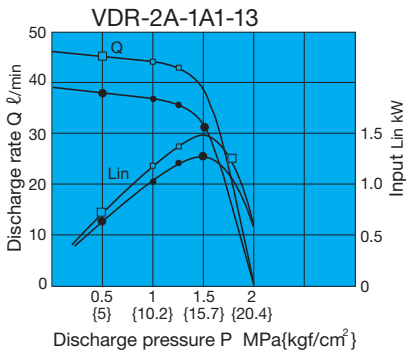
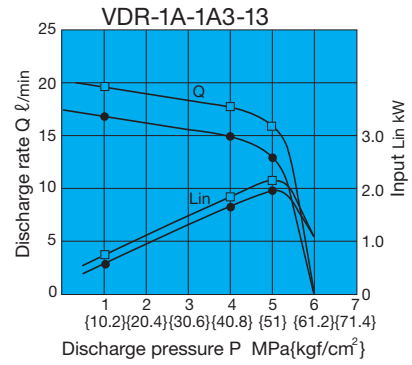
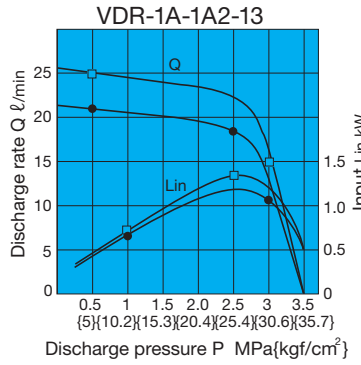
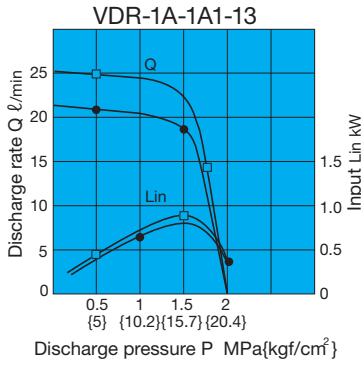
VDR-11B-*⁻13 (Flange Mounting)



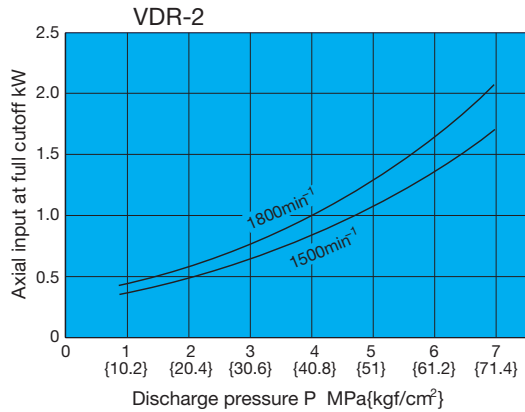
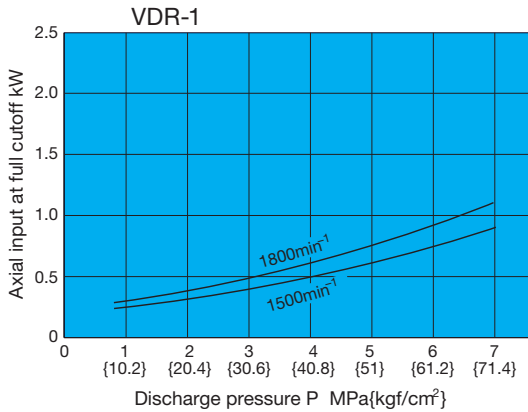
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

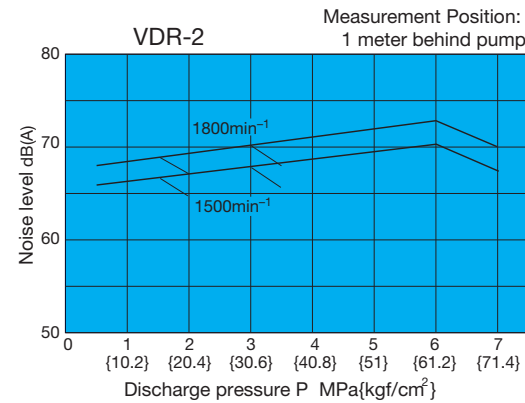
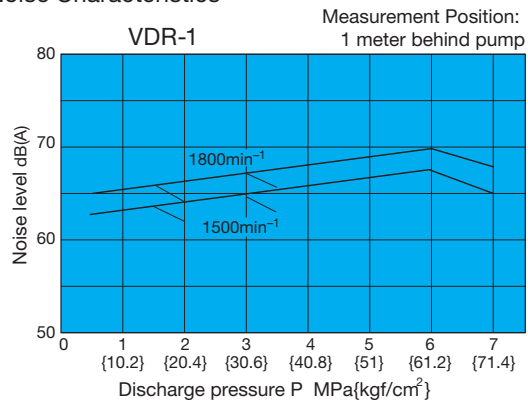
Revolution Speed 1500min⁻¹ —●—
1800min⁻¹ —□—



Axial Input At Full Cutoff

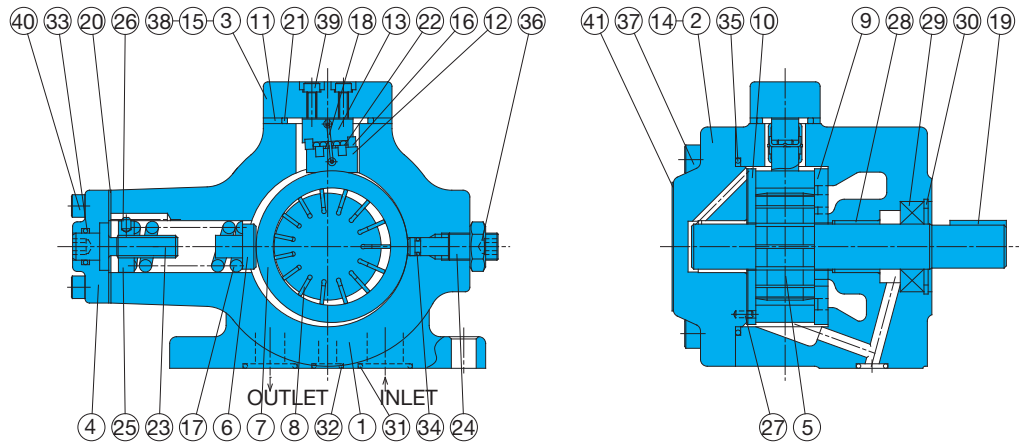


Noise Characteristics



Cross-sectional Drawings

VDR-1A-*-13
VDR-2A-*-13



List of Sealing Parts

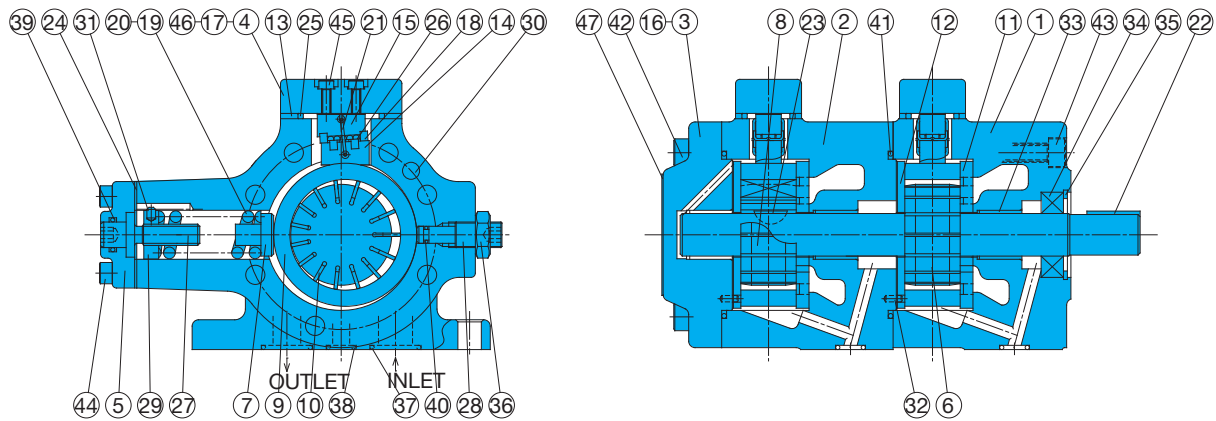
Part No.	Applicable Pump Model No.	VDR-1A-*-13		VDR-2A-*-13	
	Seal Kit Number	VDAS-101A00		VDAS-102A00	
	Part Name	Part Number	Q'ty	Part Number	Q'ty
20	Packing	VD32J-101000	1	VD32J-102000	1
21	Square ring	VD33J-101000	1	NBR-70-1 G45	1
29	Oil seal	ISRD-204010F	1	TCV-284811-V	1
31	O-ring	NBR-70-1 P20	2	NBR-70-1 G30	2
32	O-ring	NBR-70-1 P10A	1	NBR-70-1 P12	1
33	O-ring	NBR-70-1 P12	1	NBR-70-1 P14	1
34	O-ring	NBR-70-1 P5	1	NBR-70-1 P9	1
35	O-ring	NBR-70-1 G70	1	NBR-70-1 G100	1

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co.Ltd. (NOK).

2. The materials and hardness of the O-ring conform with JIS B2401.
3. For VDR-*B-*-13, the seal kit number becomes VDBS-10*B00, without the 31 and 32 O-rings.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	15	Shim	29	Oil seal
2	Cover	16	Retainer	30	Snap ring
3	Cover	17	Spring	31	O-ring
4	Cover	18	Spring	32	O-ring
5	Shaft	19	Key	33	O-ring
6	Piston	20	Packing	34	O-ring
7	Ring	21	Square ring (O-ring)	35	O-ring
8	Vane	22	Needle	36	Nut
9	Plate (S)	23	Screw	37	Screw
10	Plate (H)	24	Screw	38	Screw
11	Plate	25	Nut	39	Screw
12	Holder	26	Pin	40	Screw
13	Holder	27	Pin	41	Nameplate
14	Shim	28	Bearing		

VDR-11A-*-13



List of Sealing Parts

Part No.	Applicable Pump Model No.	VDR-11A-*-13	
	Seal Kit Number	VDAS-111A00	
	Part Name	Part Number	Q'ty
24	Packing	VD32J-101000	2
25	Square ring	VD33J-101000	2
34	Oil seal	ISRD-204010F	1
37	O-ring	NBR-70-1 P20	4
38	O-ring	NBR-70-1 P10A	2
39	O-ring	NBR-70-1 P12	2
40	O-ring	NBR-70-1 P5	2
41	O-ring	NBR-70-1 G70	2

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).

2. The materials and hardness of the O-ring conform with JIS B2401.

3. For VDR-11B-*-13, the seal kit number becomes VDDBS-111B00, without the 37 and 38 O-rings.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	11	Plate (S)	21	Spring
2	Body	12	Plate (H)	22	Key
3	Cover	13	Plate	23	Key
4	Cover	14	Holder	24	Packing
5	Cover	15	Holder	25	Square ring
6	Shaft	16	Shim	26	Needle
7	Piston	17	Shim	27	Screw
8	Rotor	18	Retainer	28	Screw
9	Ring	19	Spring	29	Nut
10	Vane	20	Spring	30	Pin
				31	Pin
				32	Pin
				33	Bearing
				34	Oil seal
				35	Snap ring
				36	Nut
				37	O-ring
				38	O-ring
				39	O-ring
				40	O-ring
				41	O-ring
				42	Screw
				43	Screw
				44	Screw
				45	Screw
				46	Screw
				47	Nameplate

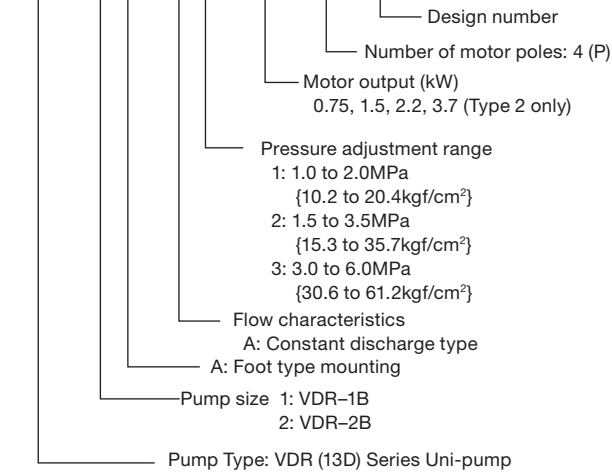
Uni-pump Specifications

(CE mark standard compliant)

Understanding Model Numbers

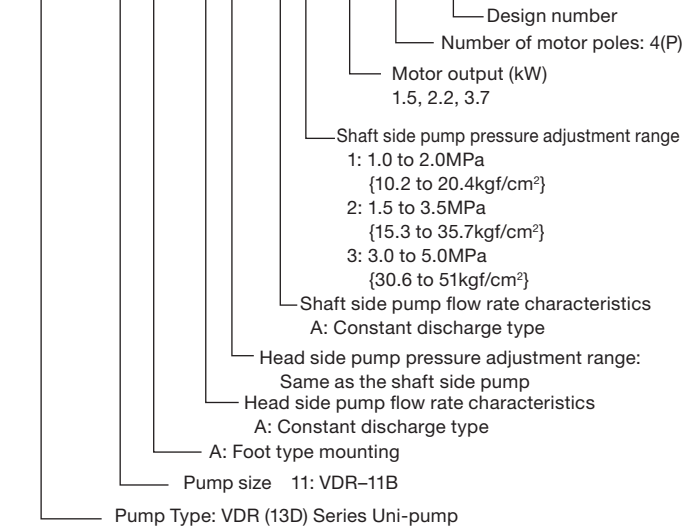
Single Pump

UVD - 1 A - A 2 - 1.5 - 4 - 50



Double Pump

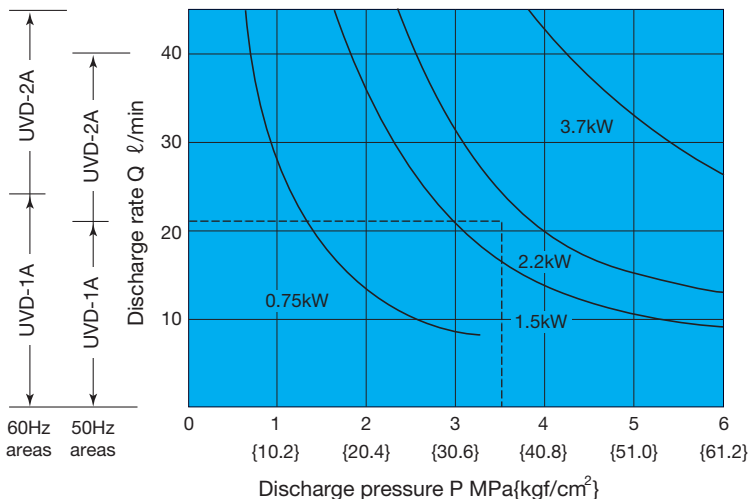
UVD - 11 A - A * - A * - * - 4 - 50



Specifications

Model No.	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	
		50Hz	60Hz
UVD- 1A	6 {61.2}	21	25
UVD- 2A	5 {51.0}	38	45
UVD-11A	5 {51.0}	21-21	25-25

Motor Selection Curves



● Selecting a motor

The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

Example:

To find the motor that can produce pressure of 3.5MPa and a discharge rate of 21 ℓ/min.

Selection Process

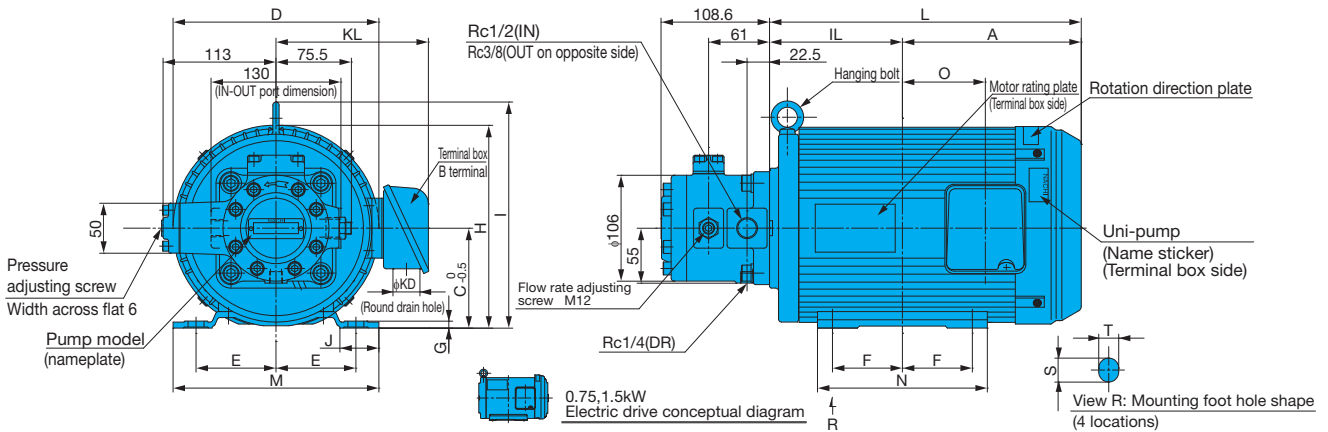
Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 21ℓ/min intersect in the area under the 2.2kW curve, it means that a 2.2kW motor should be used. In the case of a double pump configuration, select a motor that is larger than the total power required by both pumps.

* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.

* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Installation Dimension Drawings

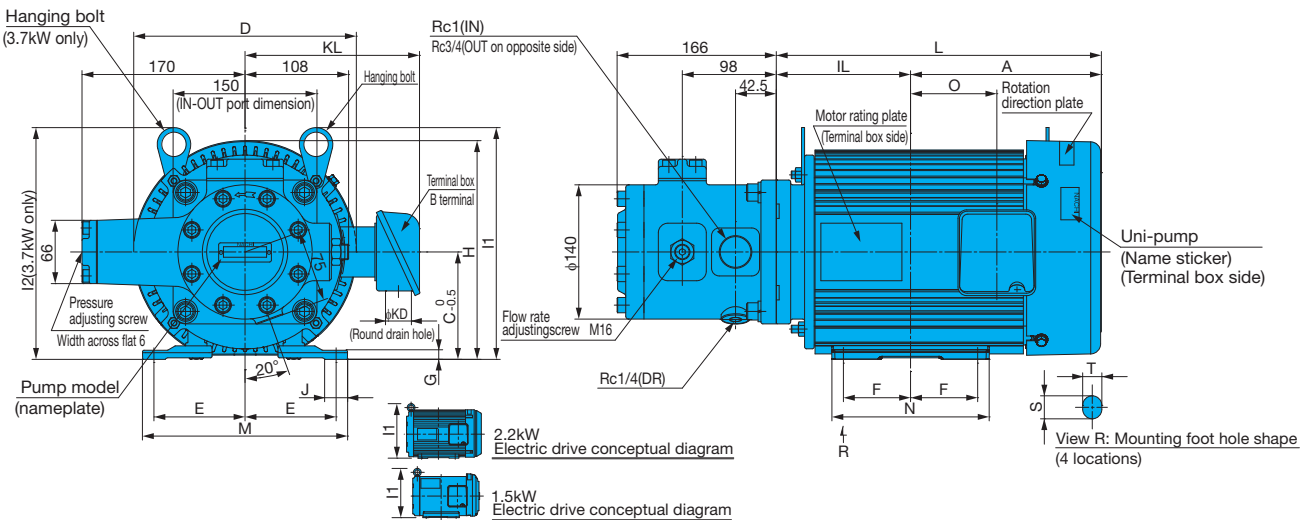
UVD-1A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output [kW] (4 poles)	Weight [kg]	
	A	IL	C	D	E	F	G	H	I	J	L	M	N	SxT	φ KD	KL	O				
UVD-1A-A1-0.75-4-50	137	105	80	152	62.5	50	4.5	160	193	47.5	242	165	130	25x10	27	137	65	80M	0.75	27	
UVD-1A-A2-0.75-4-50																					
UVD-1A-A2-1.5-4-50	160.5	118.5	90	183	70	62.5	4.4	183	204	22	279	165	152.5	16x10	27	142	68	90L	1.5	30	
UVD-1A-A3-1.5-4-50																					
UVD-1A-A3-2.2-4-50	179	133	100	206	80	70	7	203	226	39	312	206	170	14x12	27	153	83	100L	2.2	44	

1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

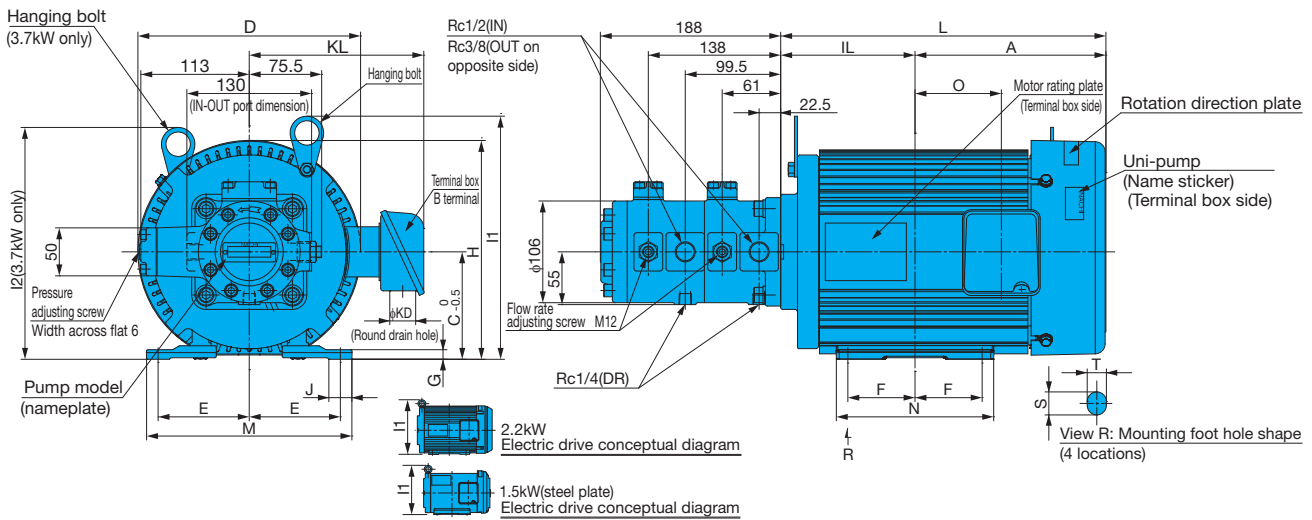
UVD-2A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output [kW] (4 poles)	Weight [kg]	
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	SxT	φ KD	KL				O
UVD-2A-A1-1.5-4-50	160.5	118.5	90	183	70	62.5	4.4	183	204	-	22	279	165	152.5	16x10	27	142	68	90L	1.5	43
UVD-2A-A2-1.5-4-50																					
UVD-2A-A2-2.2-4-50	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	57
UVD-2A-A3-2.2-4-50																					
UVD-2A-A2-3.7-4-50	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	61
UVD-2A-A3-3.7-4-50																					

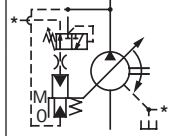
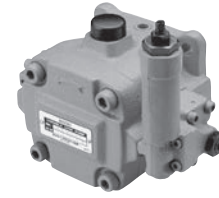
1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

UVD-11A



Uni-pump	Motor Dimensions [mm]																		Frame No.	Output kW (4 poles)	Weight kg
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	SxT	φ KD	KL	O			
UVD-11A-A1-A1-1.5-4-50	160.5	118.5	90	183	70	62.5	4.4	183	204	-	22	279	165	152.5	16x10	27	142	68	90L	1.5	36
UVD-11A-A1-A2-1.5-4-50																					
UVD-11A-A1-A3-1.5-4-50																					
UVD-11A-A2-A2-1.5-4-50																					
UVD-11A-A2-A3-1.5-4-50																					
UVD-11A-A3-A3-1.5-4-50	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	50
UVD-11A-A1-A2-2.2-4-50																					
UVD-11A-A1-A3-2.2-4-50																					
UVD-11A-A2-A2-2.2-4-50																					
UVD-11A-A2-A3-2.2-4-50																					
UVD-11A-A3-A3-2.2-4-50	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	54
UVD-11A-A1-A3-3.7-4-50																					
UVD-11A-A2-A2-3.7-4-50																					
UVD-11A-A2-A3-3.7-4-50																					
UVD-11A-A3-A3-3.7-4-50																					

1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).



VDC Series High-Pressure Type Variable Volume Vane Pump

30 to 120ℓ/min
14MPa

Features

① Highly efficient and stable high-pressure operation

Innovative pressure control and pressure balance mechanisms combine with an original 3-point ring support system dramatically improves high-pressure operation. The result is outstanding performance at high pressures up to 14MPa.

② Low vibration and noise

A number of innovative new mechanisms are adopted to minimize vibration and noise. In particular, a 3-point support system is used for the control piston and bias piston to increase ring

stability. This minimizes ring vibration and delivers quiet operation.

③ Outstanding response, high-precision operation

An innovative new ring stopper eliminates excessive ring displacement and improves response. The result is high precision operation at all times, including during starts, stops, and load changes.

④ Precise characteristics for a stable discharge rate

A revolutionary new pressure compensator type pressure control mechanism

ensures a highly stable fixed discharge rate, even in the high pressure range.

⑤ High efficiency operation with minimal power loss

New mechanical innovations minimize power loss, especially at full cutoff.

⑥ Simplified maintenance and handling

Pressure adjusting and discharge rate adjusting mechanisms are located on the same side of the pump for simplified maintenance and handling.

Specifications

Model No.	Capacity cm ³ /rev	No-load Discharge Rate ℓ/min				Pressure Adjustment Range MPa {kgf/cm ² }	Allowable Peak Pressure MPa {kgf/cm ² }	Revolution Speed min ⁻¹		Weight kg
		1000min ⁻¹	1200min ⁻¹	1500min ⁻¹	1800min ⁻¹			Min.	Max.	
VDC-1A(B)-1A2-20 1A3 1A4 1A5	16.7	16.7	20	25	30	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4} 5 to 10.5 {51 to 107} 7 to 14 {71.4 to 143}	14 {143} 21 {214}	800	1800	9.5
VDC-1A(B)-2A2-20 2A3	22	22	27	33	40	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4}	14 {143}	800	1800	9.5
VDC-2A(B)-1A2-20 1A3 1A4 1A5	30	30	36	45	54	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4} 5 to 10.5 {51 to 107} 7 to 14 {71.4 to 143}	14 {143} 21 {214}	800	1800	25
VDC-2A(B)-2A2-20 2A3	39	39	47	58	70	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4}	14 {143}	800	1800	25
VDC-3A(B)-1A2-20 1A3 1A4 1A5	67	67	80	100	120	1.5 to 3.5 {15.3 to 35.7} 2 to 7 {20.4 to 71.4} 5 to 10.5 {51 to 107} 7 to 14 {71.4 to 143}	14 {143} 21 {214}	800	1800	47 (33)

Double Pump

Model No.	Vent Side			Shaft Side			Revolution Speed min ⁻¹		Weight kg
	Discharge Rate ℓ/min		Pressure Adjust- ment Range MPa {kgf/cm ² }	Discharge Rate ℓ/min		Pressure Adjust- ment Range MPa {kgf/cm ² }	Min.	Max.	
	1800min ⁻¹	1500min ⁻¹		1800min ⁻¹	1500min ⁻¹				
VDC-11A(B)-2A3-2A3-20 VDC-11A(B)-2A3-1A5-20	40	33	2 to 7 {20.4 to 71.4}	40 30	33 25	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 27 Type B 20
VDC-12A(B)-2A3-2A3-20 VDC-12A(B)-2A3-1A5-20 VDC-12A(B)-1A5-2A3-20 VDC-12A(B)-1A5-1A5-20	40 30	33 25	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	70 54 70 54	58 45 58 45	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143} 2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 42 Type B 35
VDC-22A(B)-2A3-2A3-20 VDC-22A(B)-2A3-1A5-20	70	58	2 to 7 {20.4 to 71.4}	70 54	58 45	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 62 Type B 50
VDC-13A(B)-2A3-1A3-20 VDC-13A(B)-2A3-1A5-20 VDC-13A(B)-1A5-1A3-20 VDC-13A(B)-1A5-1A5-20	40 30	33 25	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	120	100	2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143} 2 to 7 {20.4 to 71.4} 7 to 14 {71.4 to 143}	800	1800	Type A 62 Type B 48

Note) 1. VDC-3A, VDC-11A, VDC-12A and VDC-13A are foot mounting types, and come with foot mountings.

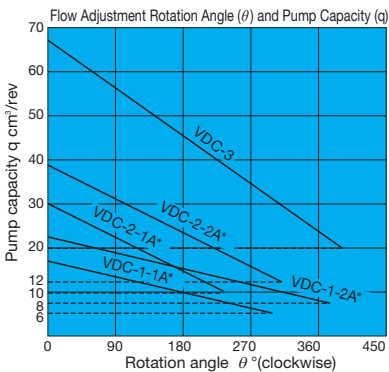
2. VDC-1A and VDC-2A are sub plate types. Sub plates are not included.

● Handling

- 1] Rotation Direction The direction of rotation is always clockwise (rightward) when viewed from the shaft side.
- 2] Drain Drain piping must be direct piping up to a point that is below the tank fluid level, and piping should comply with the conditions shown in the table below to ensure that back pressure due to pipe resistance does not exceed 0.1MPa. When using a pump that has drain ports at two locations, use the drain port that is higher after the pump is installed. In the case of a double pump, run separate pipes from both the shaft side and the head side drains directly connect to the tank, so the drain pipe is below the surface of the oil.

Model No.	VDC-1	VDC-2	VDC-3
Pipe Joint Size	At least 1/4"	At least 1/4"	At least 3/8"
Pipe I.D.	At least ϕ 7.6	At least ϕ 7.6	At least ϕ 9.6
Pipe Length	1m or less	1m or less	1m or less

- 3] Discharge Volume Adjustment
The discharge flow rate is decreased by clockwise (rightward) rotation of the discharge rate adjusting screw, and increased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut. The graph below provides general guidelines for the relationship between the rotation angle of the flow rate adjusting screw and the no-load discharge rate.
However: $Q=q \times N \times 10^{-3}$
Q : No-load Discharge Rate $Q\ell/\text{min}$
q : Volume cm^3/rev
N : Revolution Speed min^{-1}



- 5] Factory Default P-Q Settings (Standard Model)
 - Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
 - Pressure Setting = Pressure shown in table below
- 6] Thrust Screw and Stopper
The thrust screw and stopper are precision adjusted at the factory during assembly. Never touch them. See callouts 15/43 and 15/38 in the VDC-1A and 2A/3A cross-section diagrams on pages B-33 and B-34.
- 7] An unload circuit is required when the motor is started under condition $\lambda - \Delta$. Contact your agent about the unload circuit.
- 8] Initial Operation
Before operating the pump for the first time, put the pump discharge side into the no-load state and then repeatedly start and stop the motor to bleed all air from inside the pump and the suction piping. After confirming that the pump is discharging oil, continue the no-load operation for at least 10 minutes to discharge all the air from the circuit. Provide an air bleed valve in circuits where it is difficult to bleed air before startup.
- 9] Sub Plate
Use the table below for to specify a sub plate type when one is required.
- 10] Foot Mounting
For a double pump with VDC-3 foot mounting, the foot mounting kit and pump are sold as a set. When only the mounting feet are required, pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit. See page B-36 for detailed dimensions.

Factory Default Pressure Settings MPa(kgf/cm ²)
2 : 3.5 {35.7}
3 : 3 {30.6}
4 : 5 {51 }
5 : 7 {71.4}

- 11] For the hydraulic operating fluid, use type ISO VG32 or equivalent (viscosity index of at least 90) for pressures of 7MPa or lower, and type ISO VG68 or equivalent (viscosity index of at least 90) for pressures greater than 7MP.
- 12] The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 0 to 60°C.
- 13] Suction pressure is -0.03 to +0.03MPa (-0.3 to +0.3kgf/cm²), and the suction port flow rate should be no greater than 2m/sec.
- 14] Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft. Mount the pump so its pump shaft is oriented horizontally.
- 15] Provide a suction strainer with a filtering grade of about 100 μm (150 mesh). For the return line to the tank, use a 25 μm line filter.
- 16] Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- 17] Contact your agent about using water- and glycol-based hydraulic operating fluids.
- 18] At startup, repeat the inching operation (start-stop) to prime the pump and bleed air from the pump and pipes. (This pump has no fluid supply port.)

(Continued on following page)

Note)

The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken line shows the flow volume adjustment range lower limit value.

- 4] Pressure Adjustment Pressure is increased by clockwise (rightward) rotation of the discharge rate adjusting screw, and decreased by counterclockwise (leftward) rotation. Loosen the lock nut before making adjustments. After adjustment is complete, re-tighten the lock nut.

Sub Plate Number

Pump Model No.	Sub Plate Number	Motor kW
VDC-1A-1A*-20	MVD-1-115-10	0.75 to 1.5
	MVD-1-135-10	2.2 to 3.7
VDC-1A-2A*-20	MVD-1-115Y-10	0.75 to 1.5
	MVD-1-135Y-10	2.2 to 3.7
VDC-2A-*A*-20	MVD-2-135-10	2.2 to 3.7
	MVD-2-160-10	5.5
VDC-2A-2A*-20	MVD-2-160Z-10	5.5

Note) See pages B-17 and B-18 for detailed dimensions.

19 Equip an air bleed valve in circuits where it is difficult to bleed air before startup. See page C-13 for more information.

20 When centering the pump shaft, eccentricity with the motor shaft should be no greater than 0.05mm. Use a pump mounting base of sufficient rigidity.

The angle error should be no greater than 1°.

● Inverter Drive Precautions

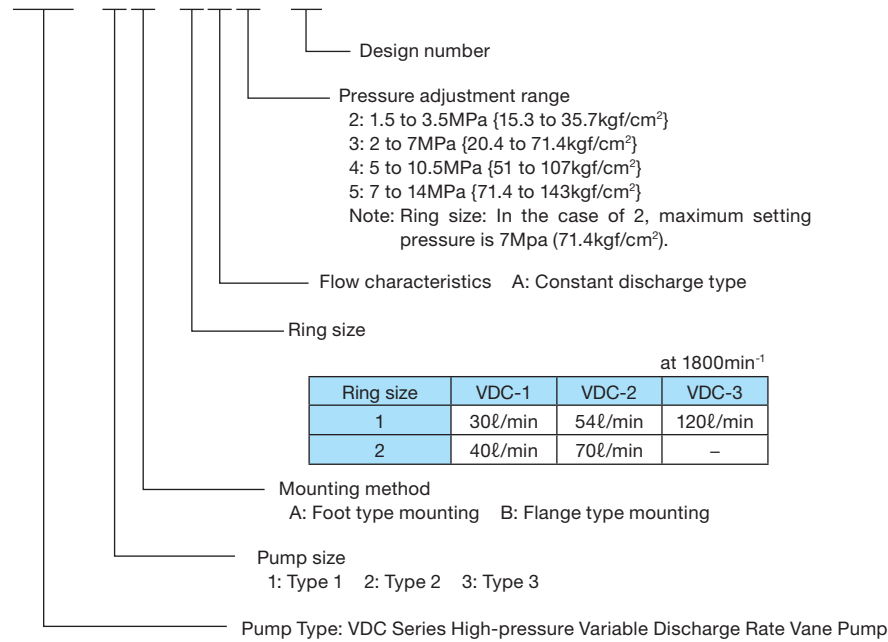
1 Set the revolution speed within the range of the pump specification revolution speed.

2 Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Explanation of model No.

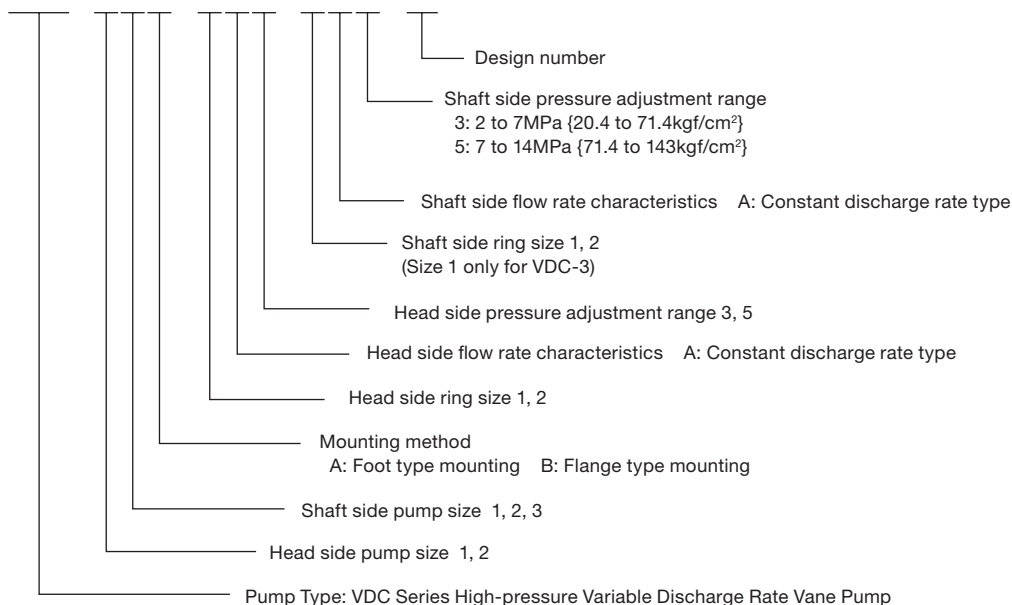
Single Pump

VDC - 2 A - 1 A 2 - 20



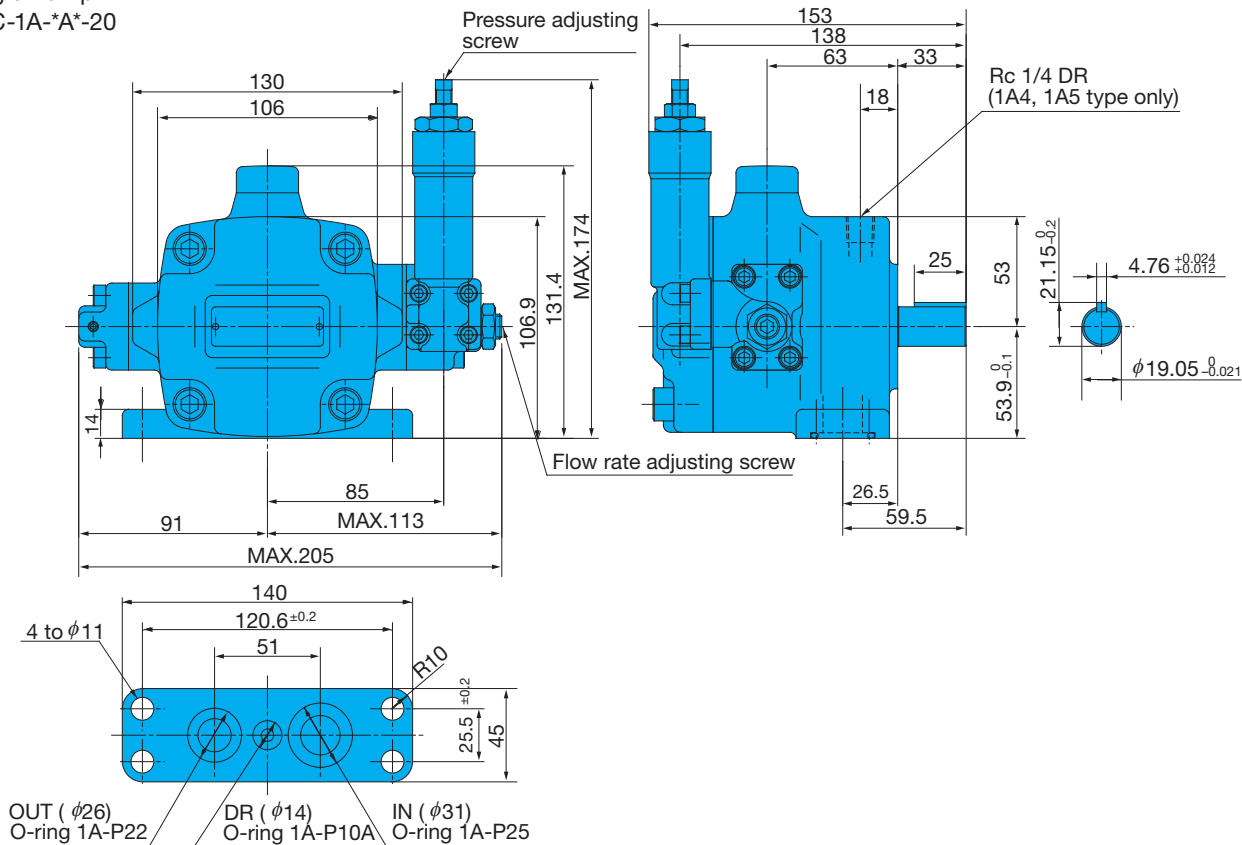
Double Pump

VDC - 1 2 A - 1 A 5 - 2 A 3 - 20

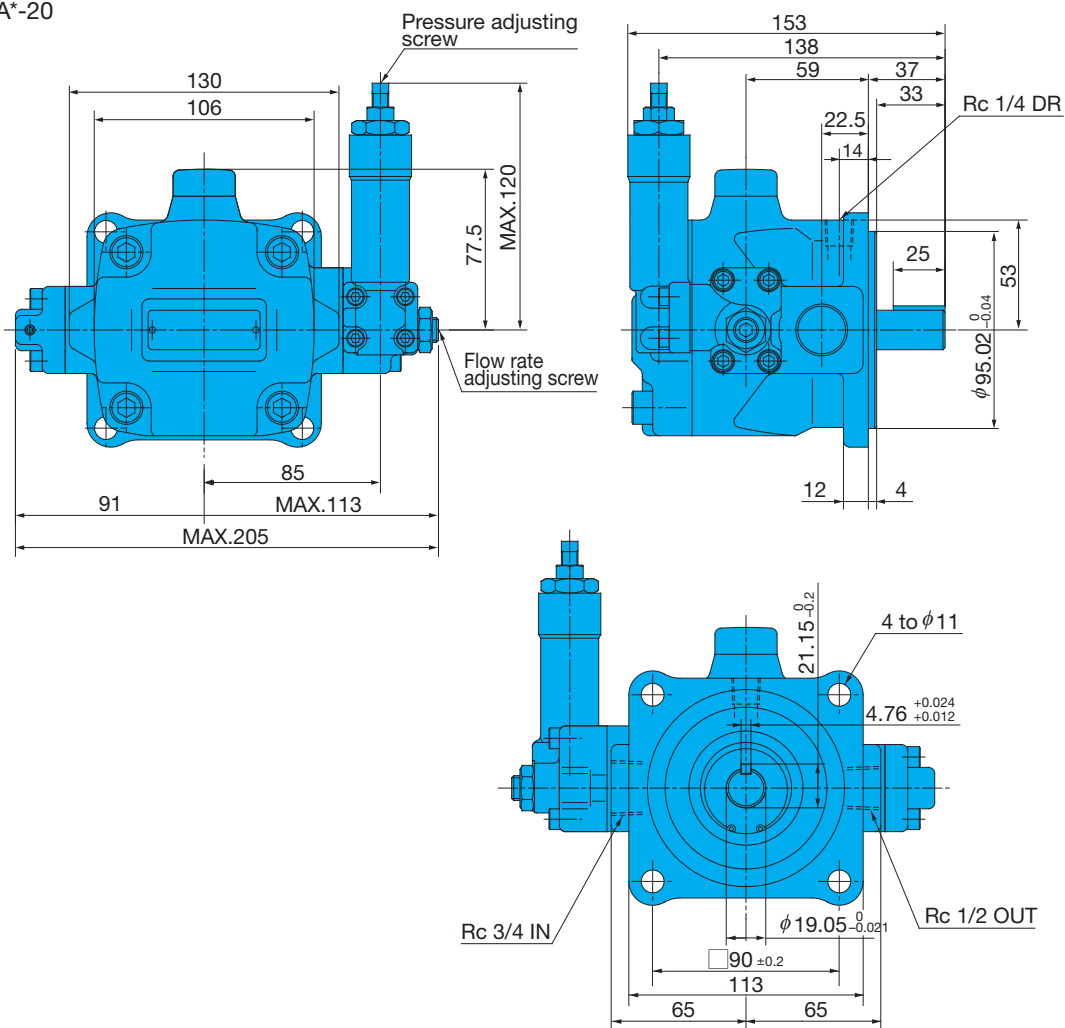


Installation Dimension Drawings

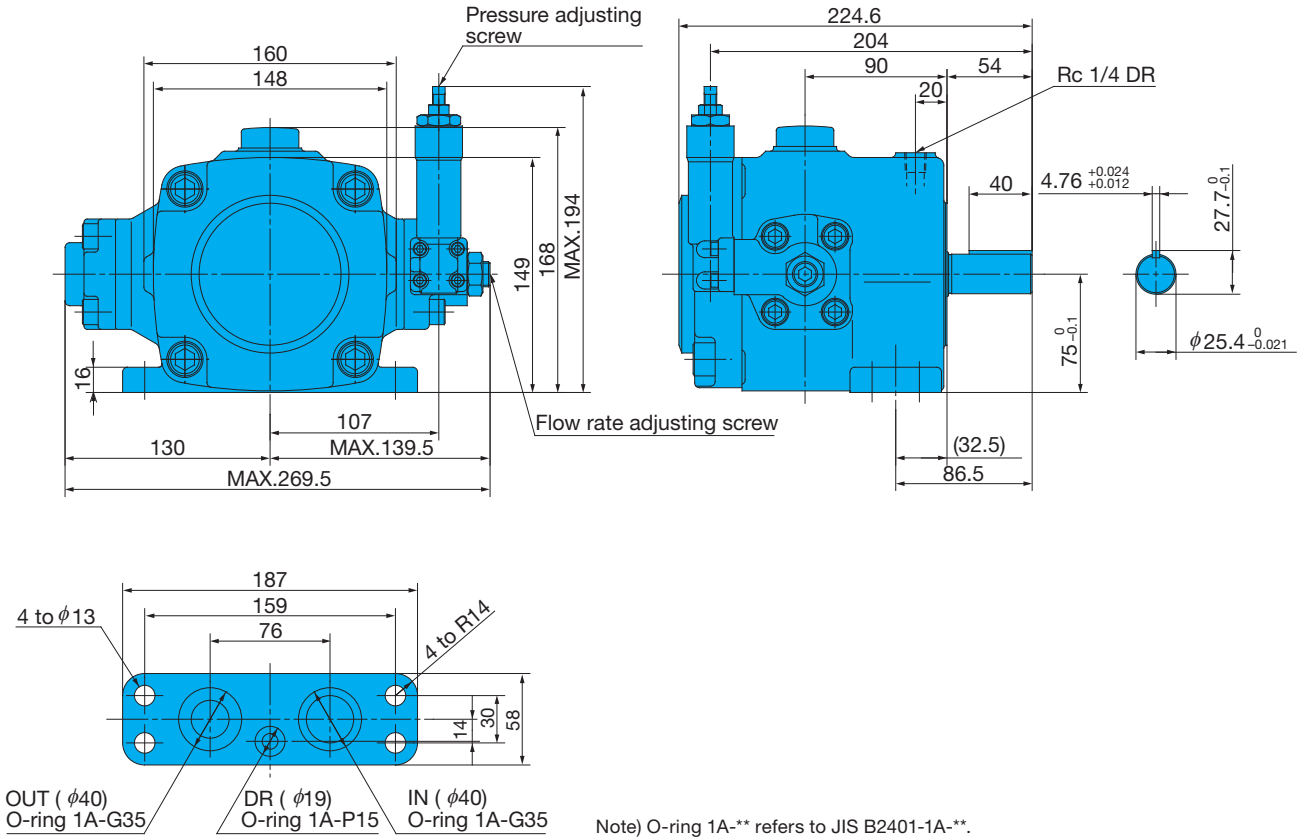
Single Pump
VDC-1A-*A*-20



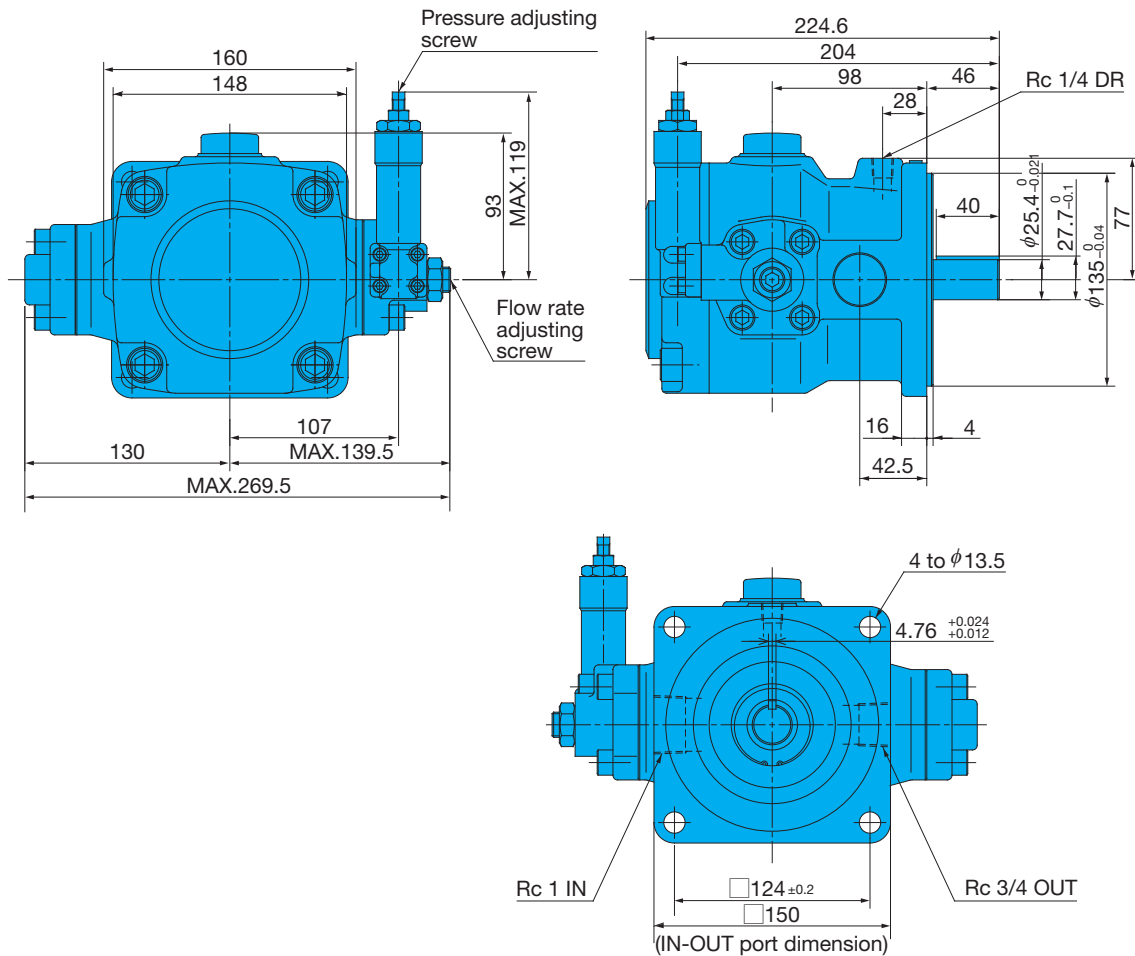
VDC-1B-*A*-20



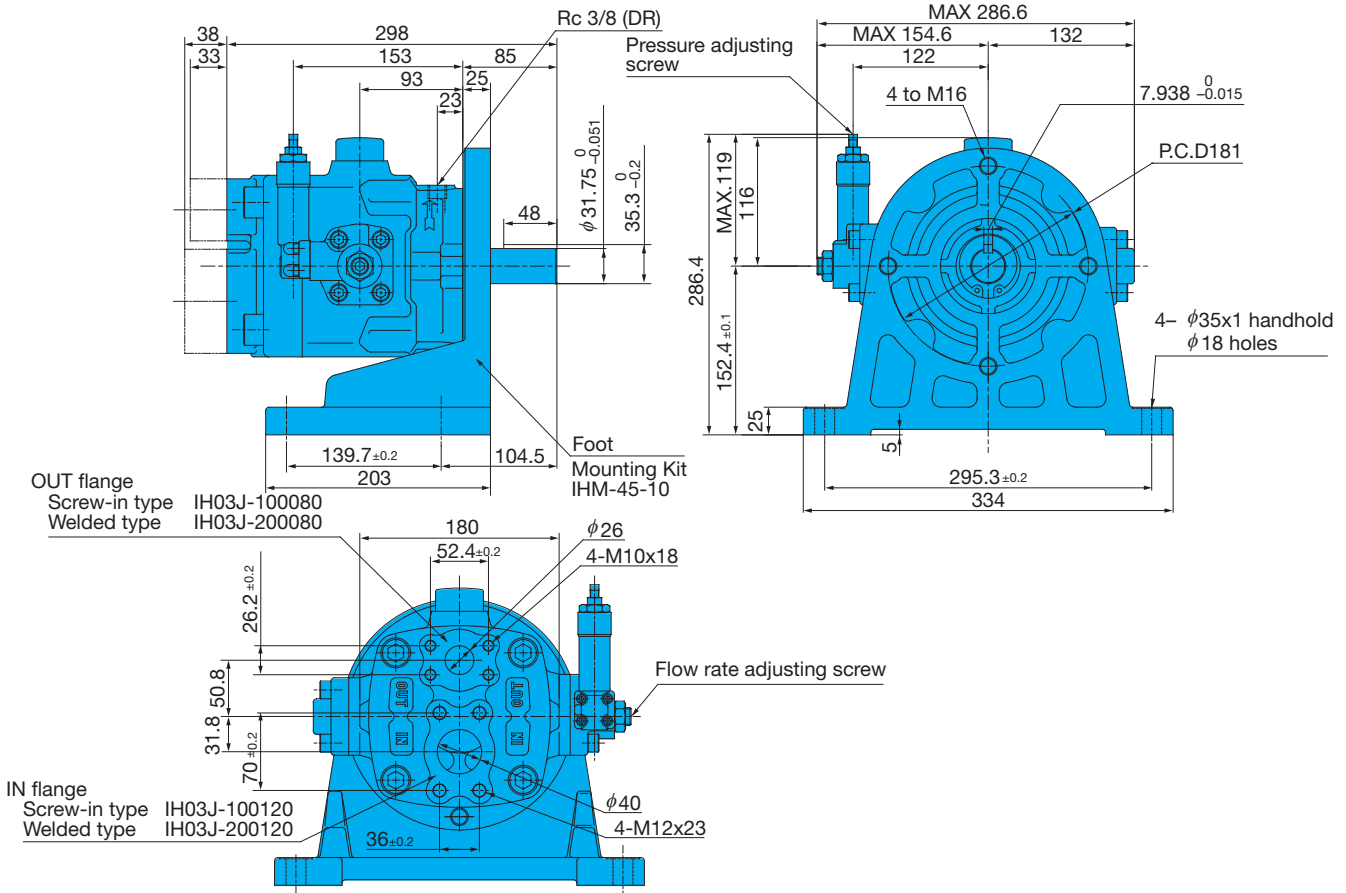
VDC-2A-*A*-20



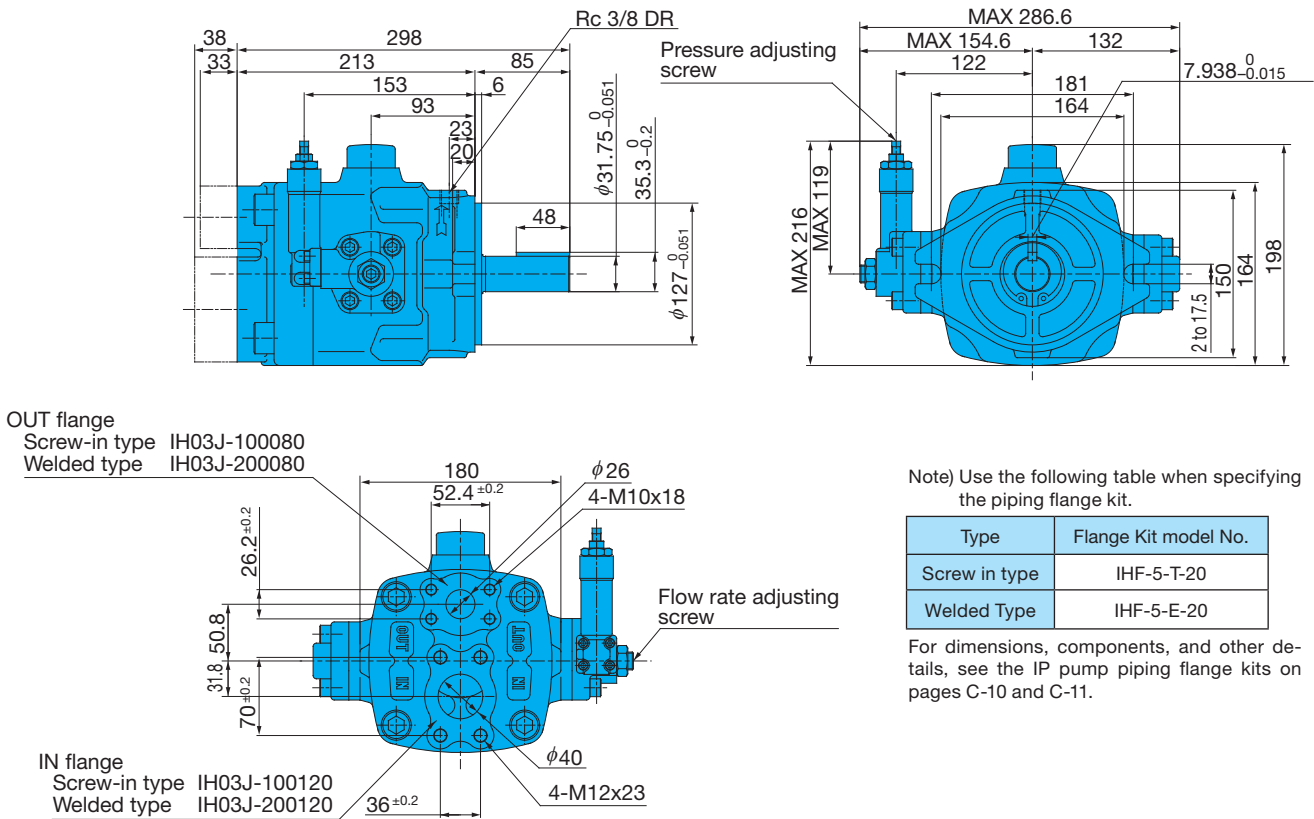
VDC-2B-*A*-20



VDC-3A-1A*-20



VDC-3B-1A*-20

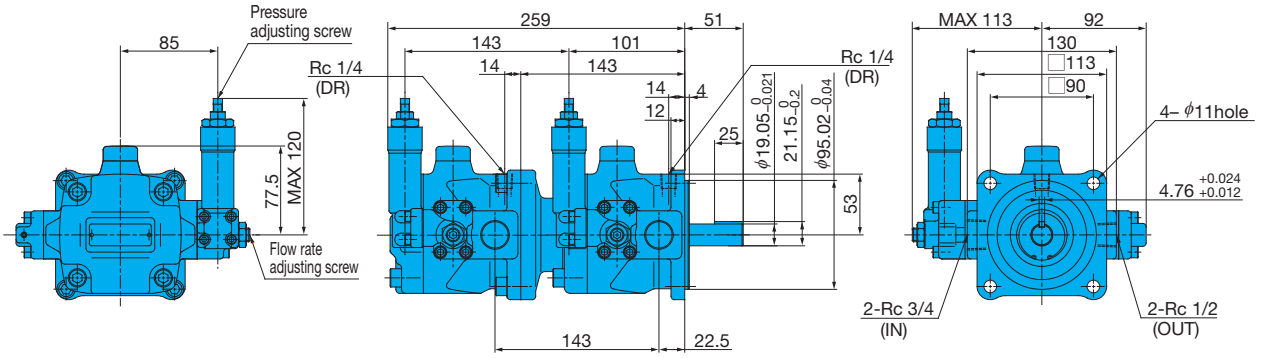


Note) Use the following table when specifying the piping flange kit.

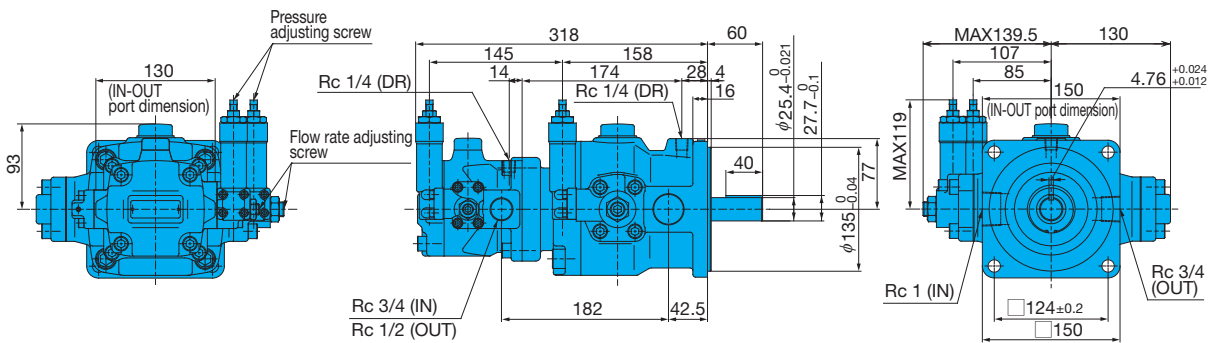
Type	Flange Kit model No.
Screw in type	IHF-5-T-20
Welded Type	IHF-5-E-20

For dimensions, components, and other details, see the IP pump piping flange kits on pages C-10 and C-11.

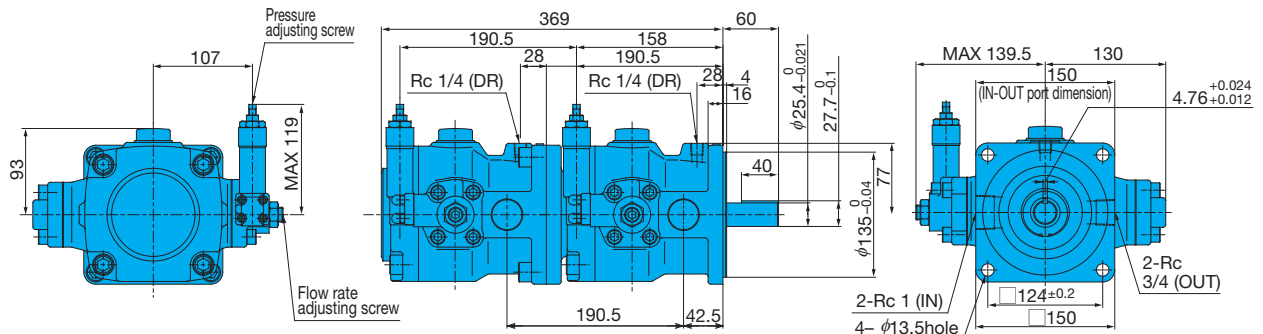
Double Pump
VDC-11B-*A*-*A*-20



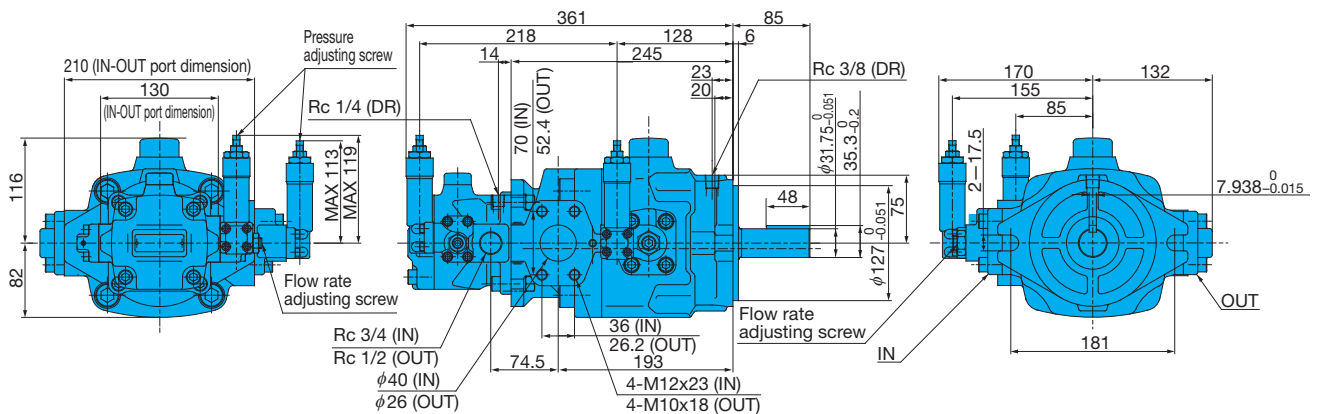
VDC-12B-*A*-*A*-20



VDC-22B-*A*-*A*-20



VDC-13B-*A*-*A*-20

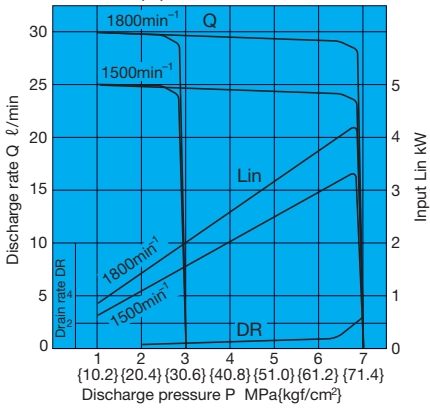


Note) 1. VDC-**A has the foot mounting kit shown on page B-36 installed.
2. Rc-* previously was PT*.

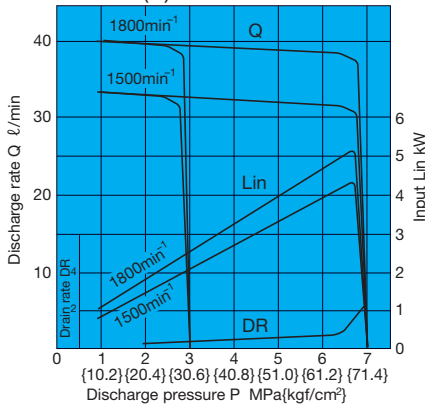
Performance Curves

Typical characteristics at hydraulic operating fluid kinematic viscosity of 32 mm²/s

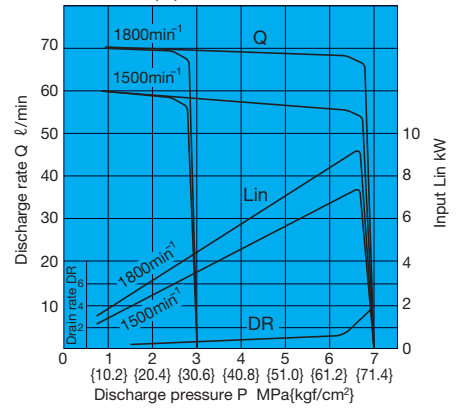
VDC-1A(B)-1A3-20



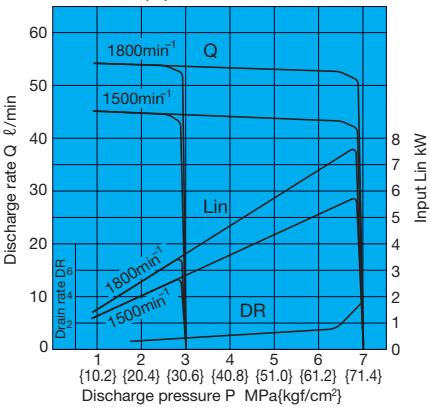
VDC-1A(B)-2A3-20



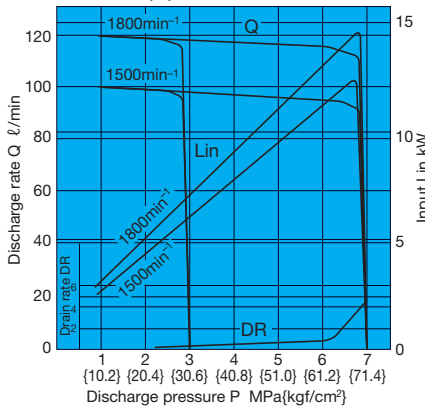
VDC-2A(B)-2A3-20



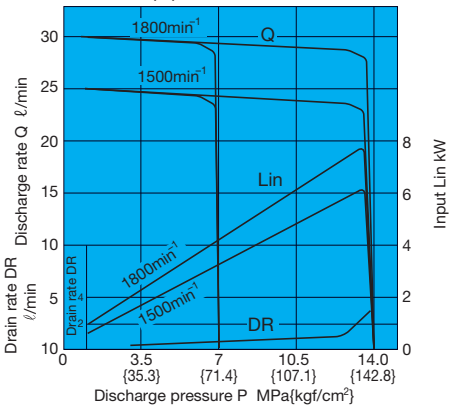
VDC-2A(B)-1A3-20



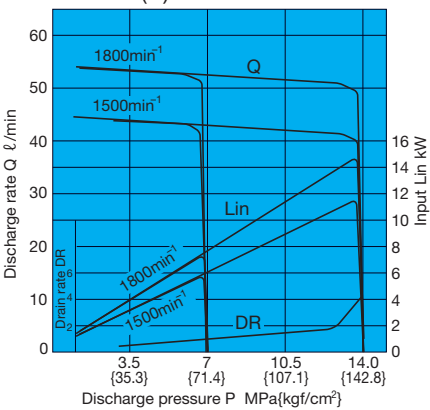
VDC-3A(B)-1A3-20



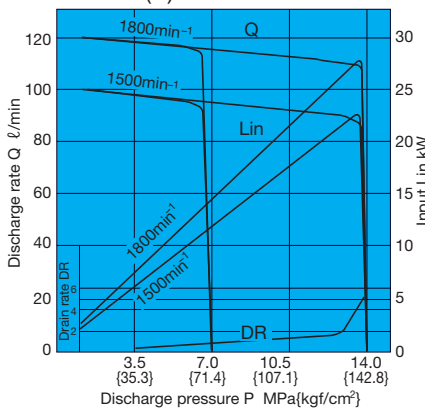
VDC-1A(B)-1A5-20



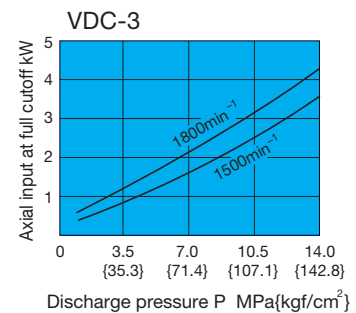
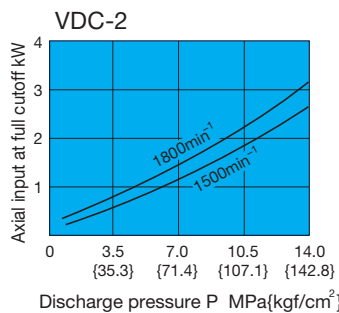
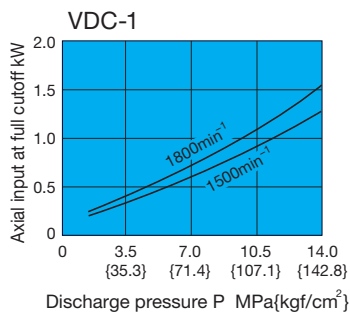
VDC-2A(B)-1A5-20



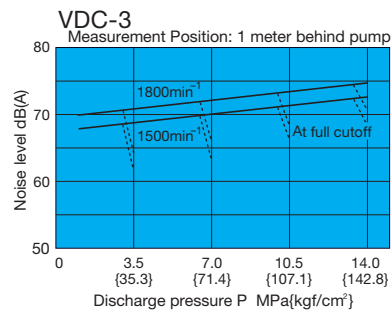
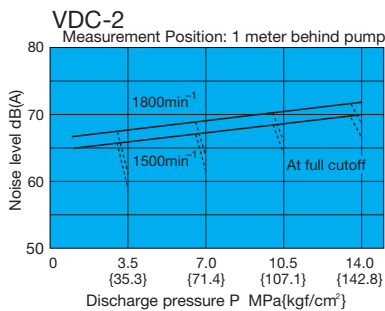
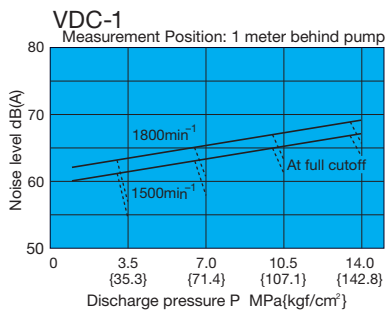
VDC-3A(B)-1A5-20



Axial input at full cutoff



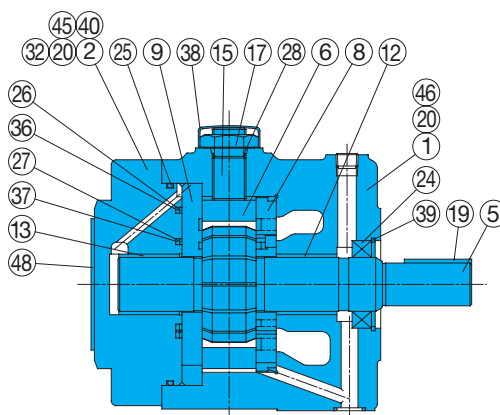
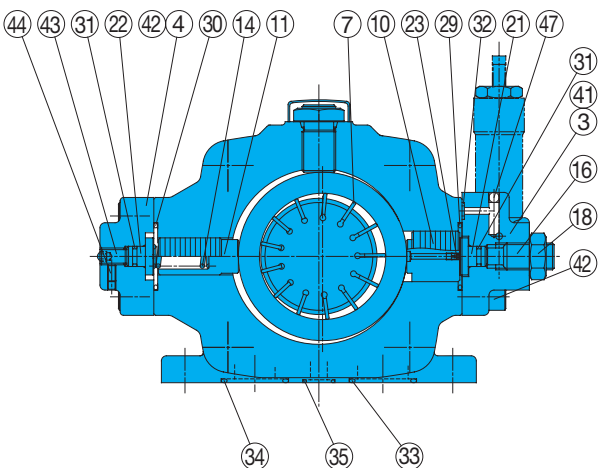
Noise Characteristics



Cross-sectional Drawings

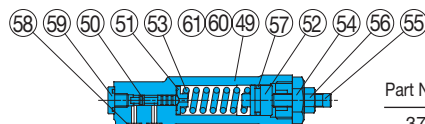
VDC-1A-*A*-20

VDC-2A-*A*-20



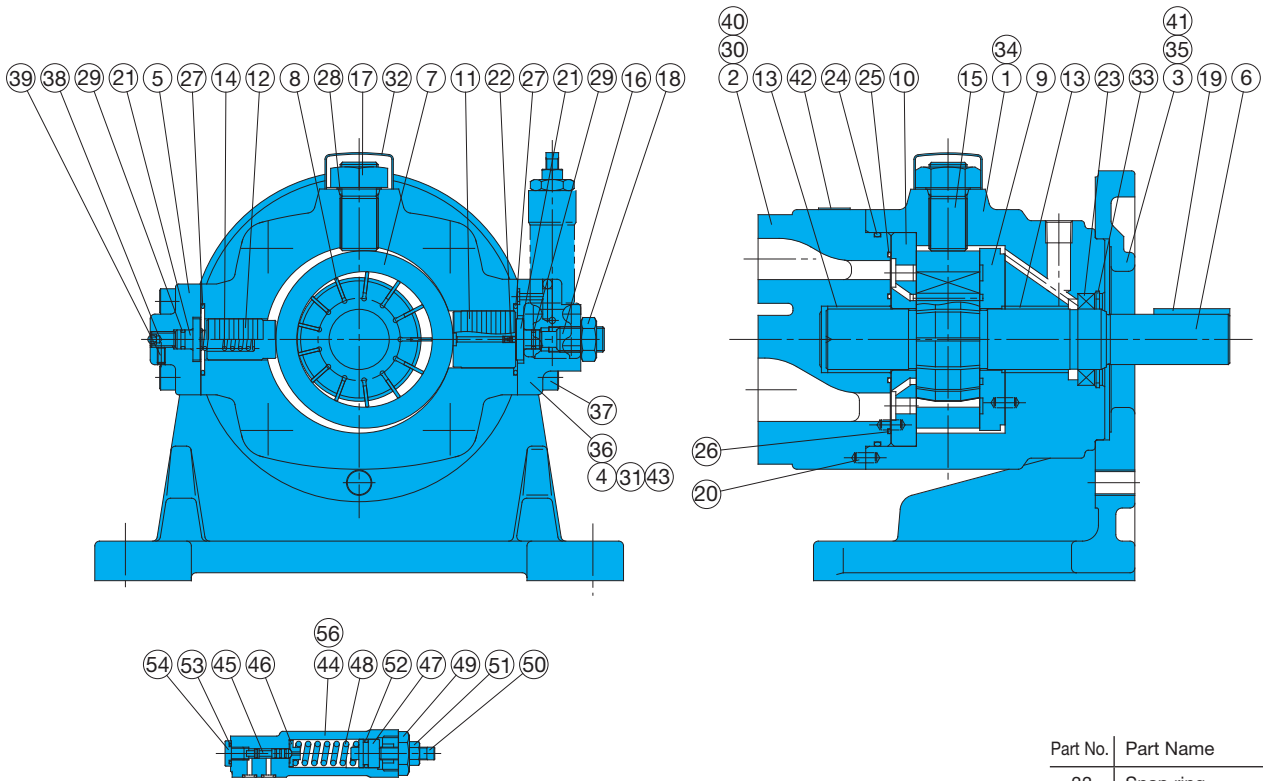
Seal Component Table (VDC-1*,VDC-2*)

Part No.	Applicable Pump Model No.	VDC-1A-*A*-20		VDC-2A-*A*-20	
	Seal Kit Number	VCBS-101A00		VCBS-102A00	
	Part Name	Part Number	Q'ty	Part Number	Q'ty
24	Oil seal	TCV-224211-V	1	TCN-325211-V	1
25	O-ring	S85(NOK)	1	NBR-70-1 G115	1
26	O-ring	AS568-034	1	AS568-150	1
27	O-ring	AS568-026	1	AS568-134	1
28	O-ring	NBR-70-1 P14	1	NBR-70-1 P18	1
29	O-ring	NBR-70-1 P22	1	NBR-70-1 G35	1
30	O-ring	NBR-70-1 P20	1	NBR-70-1 G35	1
31	O-ring	NBR-70-1 P5	2	NBR-70-1 P9	2
32	O-ring	NBR-70-1 P6	4	NBR-70-1 P7	4
33	O-ring	NBR-70-1 P25	1	NBR-70-1 G35	1
34	O-ring	NBR-70-1 P22	1	NBR-70-1 G35	1
35	O-ring	NBR-70-1 P10A	1	NBR-70-1 P15	1
36	Backup ring	VCB34-101000	1	VCB34-102000	1
37	Backup ring	VCB34-201000	1	VCB34-202000	1
57	O-ring	NBR-70-1 P14	1	NBR-70-1 P14	1
58	O-ring	NBR-90 P6	3	NBR-90 P6	3



Part No.	Part Name	Part No.	Part Name
1	Body (1)	19	Key
2	Body (2)	20	Pin
3	Cover (1)	21	Holder
4	Cover (2)	22	Holder
5	Shaft	23	Orifice
6	Ring	24	Oil seal
7	Vane	25	O-ring
8	Plate (S)	26	O-ring
9	Plate (H)	27	O-ring
10	Piston (1)	28	O-ring
11	Piston (2)	29	O-ring
12	Bearing	30	O-ring
13	Bearing	31	O-ring
14	Spring	32	O-ring
15	Thrust screw	33	O-ring
16	Screw	34	O-ring
17	Nut	35	O-ring
18	Nut	36	Backup ring
		37	Backup ring
		38	Cap
		39	Snap ring
		40	Screw
		41	Screw
		42	Screw
		43	Screw (stopper)
		44	Screw
		45	Plug
		46	Plug
		47	Pole
		48	Nameplate
		49	Valve body
		50	Spool
		51	Holder
		52	Plunger
		53	Spring
		54	Retainer
		55	Screw
		56	Nut
		57	O-ring
		58	O-ring
		59	Plug
		60	Plug
		61	Screw

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
 2. The materials and hardness of the O-ring conform with JIS B2401.
 3. For VDR-*B*-20, the seal kit number becomes VDDBS-10*B00, without the 33, 24, and 35 O-rings.



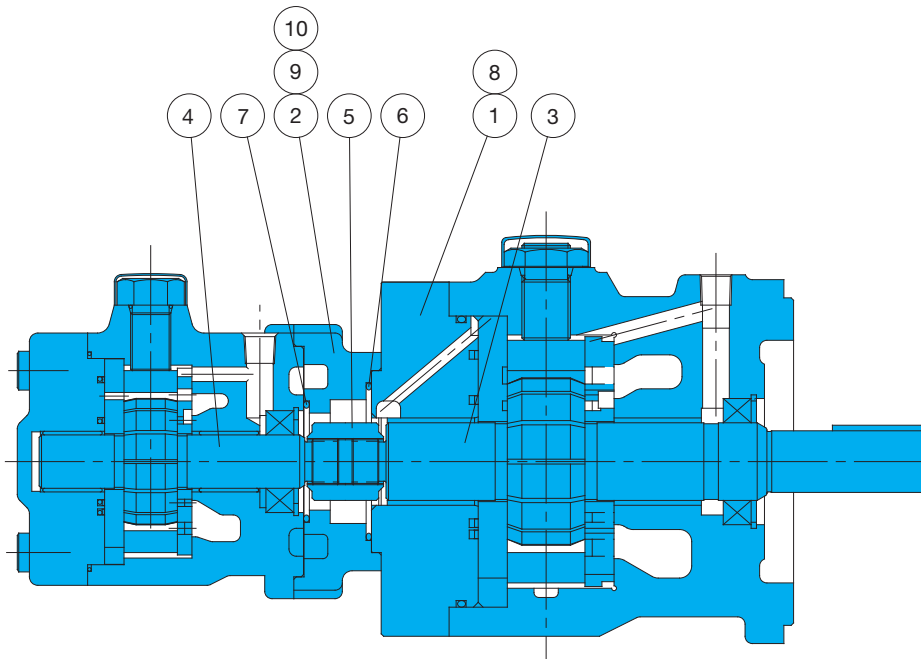
Seal Component Table (VDC-3*)

Part No.	Applicable Pump Model No.		VDC-3A(B)*-20	
	Seal Kit Number		VCBS-103B00	
	Part Name	Part Number	Q'ty	
23	Oil seal	TCN-385811-V	1	
24	O-ring	NBR-70-1 G130	1	
25	O-ring	AS568-154(NBR-90)	1	
26	O-ring	AS568-151(NBR-90)	1	
27	O-ring	NBR-70-1 G40	2	
28	O-ring	NBR-70-1 P22	1	
29	O-ring	NBR-70-1 P9	2	
30	O-ring	NBR-70-1 P7	2	
31	O-ring	NBR-70-1 P7	2	
52	O-ring	NBR-70-1 P14	1	
53	O-ring	NBR-90 P6(NBR-90)	3	

Note) 1. Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
 2. The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name	Part No.	Part Name
1	Body (1)	17	Nut
2	Body (2)	18	Nut
3	Mounting	19	Key
4	Cover (1)	20	Pin
5	Cover (2)	21	Holder
6	Shaft	22	Orifice
7	Ring	23	Oil seal
8	Vane	24	O-ring
9	Plate (S)	25	O-ring
10	Plate (H)	26	O-ring
11	Piston (1)	27	O-ring
12	Piston (2)	28	O-ring
13	Bearing	29	O-ring
14	Spring	30	O-ring
15	Thrust screw	31	O-ring
16	Screw	32	Cap
		33	Snap ring
		34	Screw
		35	Screw
		36	Screw
		37	Screw
		38	Screw (stopper)
		39	Screw
		40	Plug
		41	Washer
		42	Nameplate
		43	Pole
		44	Valve body
		45	Spool
		46	Holder
		47	Plunger
		48	Spring
		49	Retainer
		50	Screw
		51	Nut
		52	O-ring
		53	O-ring
		54	Plug
		55	Plug
		56	Screw

VDC Series
Double Pump



Part No.	Part Name
1	Body (2)
2	Body (3)
3	Shaft (S)
4	Shaft (H)
5	Joint
6	O-ring
7	O-ring
8	Screw
9	Screw
10	Screw

Note) In the case of a double pump, use single pump parts in addition to the 10 parts listed above.

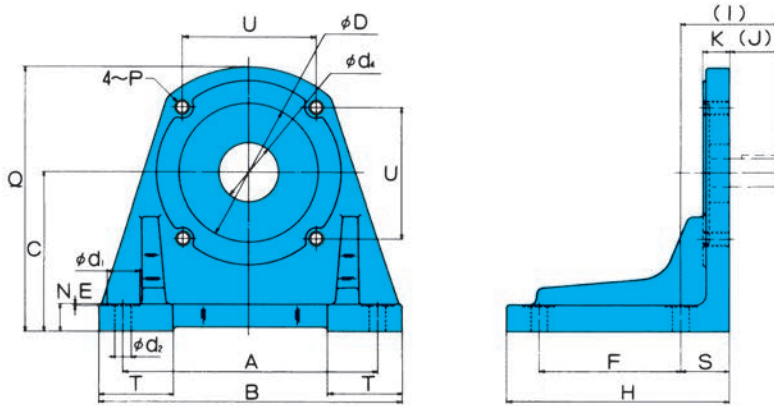
List of Sealing Parts

Part No.	Part Name	VDC-11A-*-*-20		VDC-12A-*-*-20		VDC-22A-*-*-20		VDC-13A-*-*-20	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
6	O-ring	-		NBR-70-1 G60	1	NBR-70-1 G60	1	-	
7	O-ring	NBR-70-1 G85	1	NBR-70-1 G45	1	NBR-70-1 G60	1	NBR-70-1 G85	1

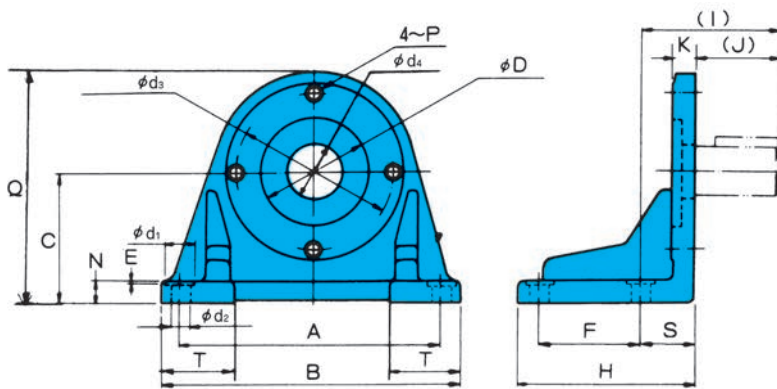
Note) 1. See the description of the single pump for seal parts that are not included in the list.
2. The materials and hardness of the O-ring conform with JIS B2401.

Foot Mounting Installation Measurement Chart

For VDC-11A, VDC-12 and VDC-22 (for double pump)



For VDC-3A and VDC-13A



Foot Mounting Kit Model No.	Applicable Pump Model No.	Accessories				Dimensions mm					
		Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F	H
VCM-11-20	VDC-1 VDC-11	TH-10×30	4	WS-B-10	4	171.45	204	107.95	1	95.25	150
VCM-22-20	VDC-2 VDC-12 VDC-22	TH-12×35	4	WS-B-12	4	235	267	139.7	1	127	193
IHM-45-10	VDC-3 VDC-13	TB-16×40	2	WP-16	2	295.3	334	152.4	1	139.7	203

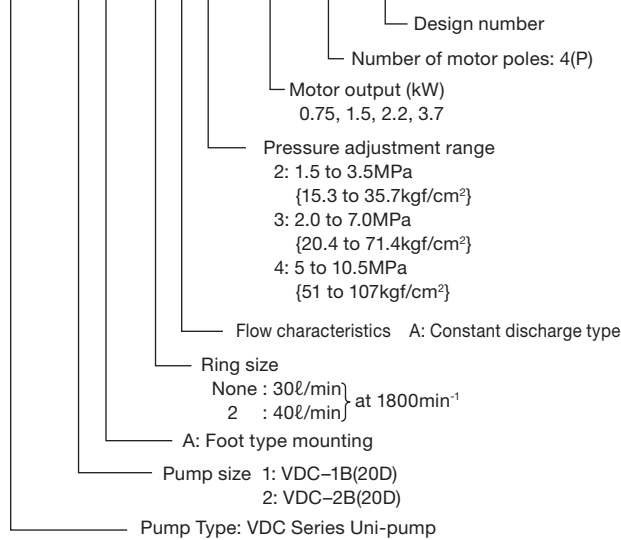
Foot Mounting Kit Model No.	Dimensions mm														Weight kg
	(I)	(J)	K	N	P	Q	S	T	U	φ D	φ d ₁	φ d ₂	φ d ₃	φ d ₄	
VCM-11-20	66.5	33	18	18	M10	180	32.5	50	90	95.02	22	11	-	40	6.5
VCM-22-20	84.5	40	20	20	M12	232	44.5	57.5	124	135	22	14	-	40	12.0
IHM-45-10	104.5	60	25	25	M16	259	44.5	61	-	127	35	18	181	86	13.5

Uni-pump Specifications

(CE mark standard compliant)

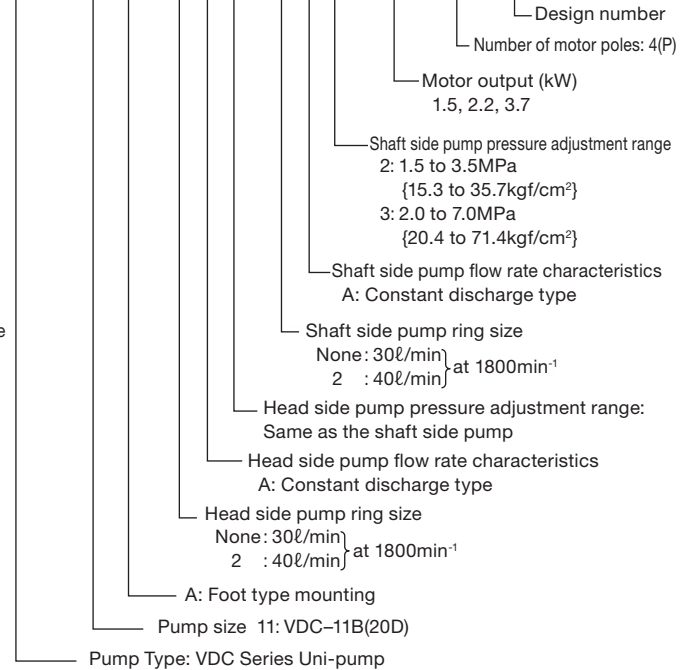
Single Pump

UVC - 1 A - 2 A 2 - 1.5 - 4 - 40



Double Pump

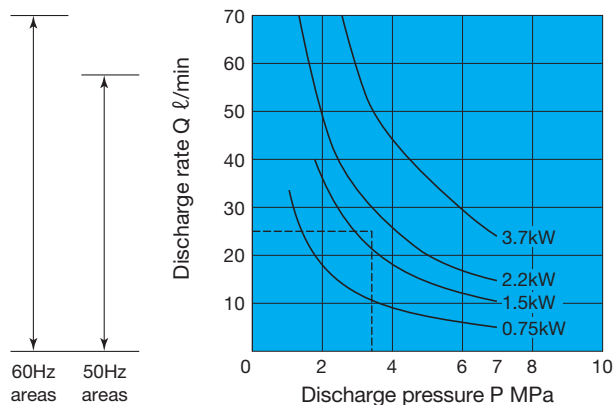
UVC - 11 A - 2 A 2 - 2 A 2 - 3.7 - 4 - 40



Specifications

Model No.	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min (A*)		Maximum Flow Rate ℓ/min (2A*)	
		50Hz	60Hz	50Hz	60Hz
UVC- 1A	7 {71.4}	25	30	33	40
UVC- 2A	7 {71.4}	45	54	58	70
UVC-11A	7 {71.4}	25-25	30-30	33-33	40-40

Motor selection curves



● Selecting a motor

The area under a motor output curve in the graph to the left is the operating range for that motor under the rated output for that motor.

Example:

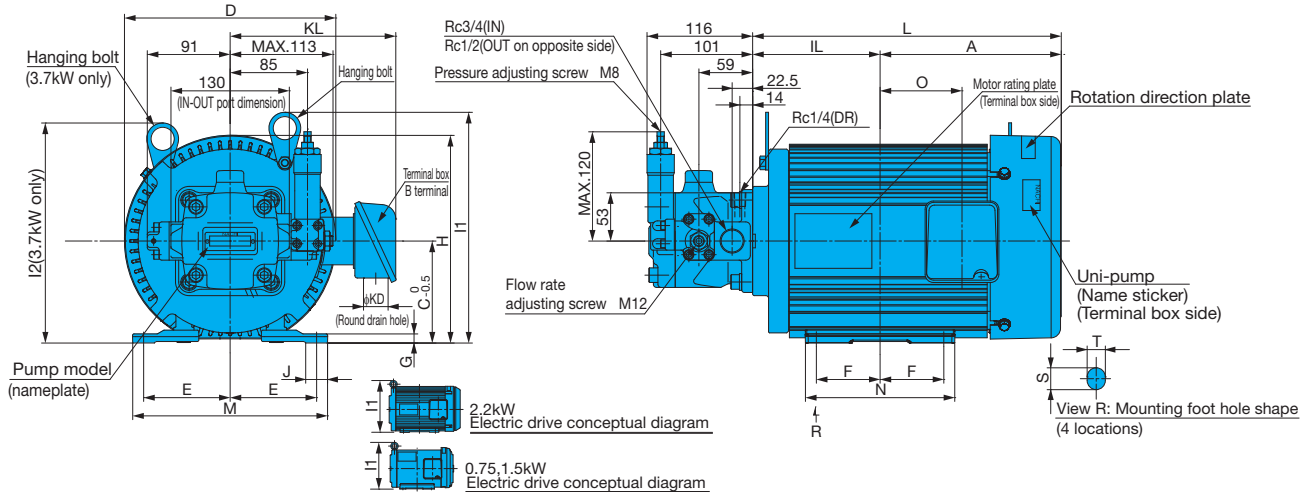
To find the motor that can produce pressure of 3.5MPa and a discharge rate of 25.0 ℓ/min. Selection Process

Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 25.0 ℓ/min intersect in the area under the 2.2kW curve, it means that a 2.2kW motor should be used. In the case of a double pump configuration, select a motor that is larger than the total power required by both pumps.

* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.
 * When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.

Installation Dimension Drawings

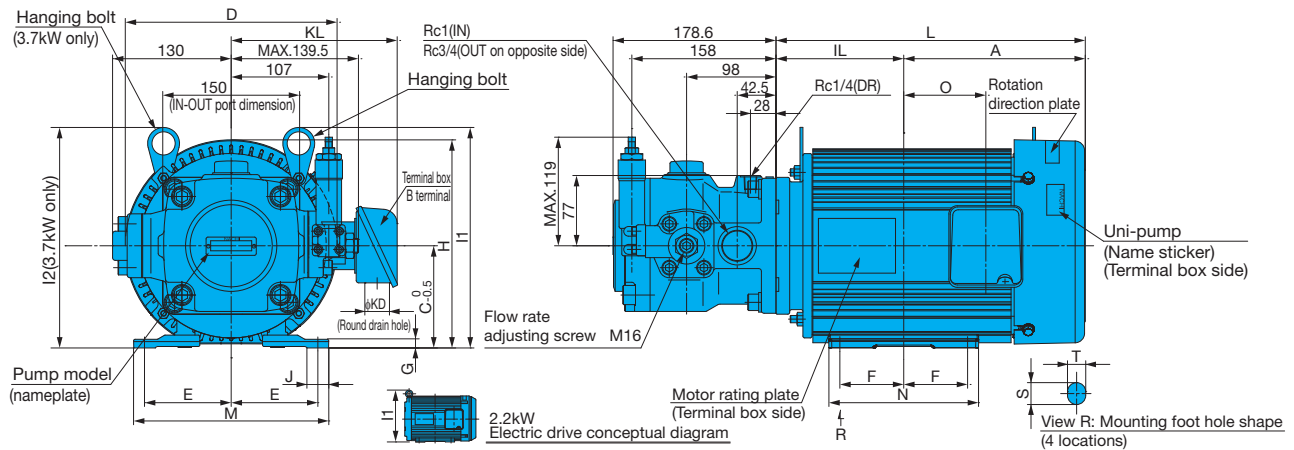
UVC-1A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg		
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	SxT	φKD	KL				O	
UVC-1A-A2-0.75-4-40	137	105	80	152	62.5	50	4.5	160	193	-	47.5	242	165	130	25x10	27	137	65	80M	0.75	28.5	
UVC-1A-A2-1.5-4-40																						
UVC-1A-A3-1.5-4-40	160.5	118.5	90	183	70	62.5	4.4	183	204	-	22	279	165	152.5	16x10	27	142	68	90L	1.5	31.5	
UVC-1A-2A2-1.5-4-40																						
UVC-1A-A2-2.2-4-40																						
UVC-1A-A3-2.2-4-40	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	45.5	
UVC-1A-2A2-2.2-4-40																						
UVC-1A-A3-3.7-4-40																						
UVC-1A-A4-3.7-4-40	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	49.5	
UVC-1A-2A2-3.7-4-40																						
UVC-1A-2A3-3.7-4-40																						

1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

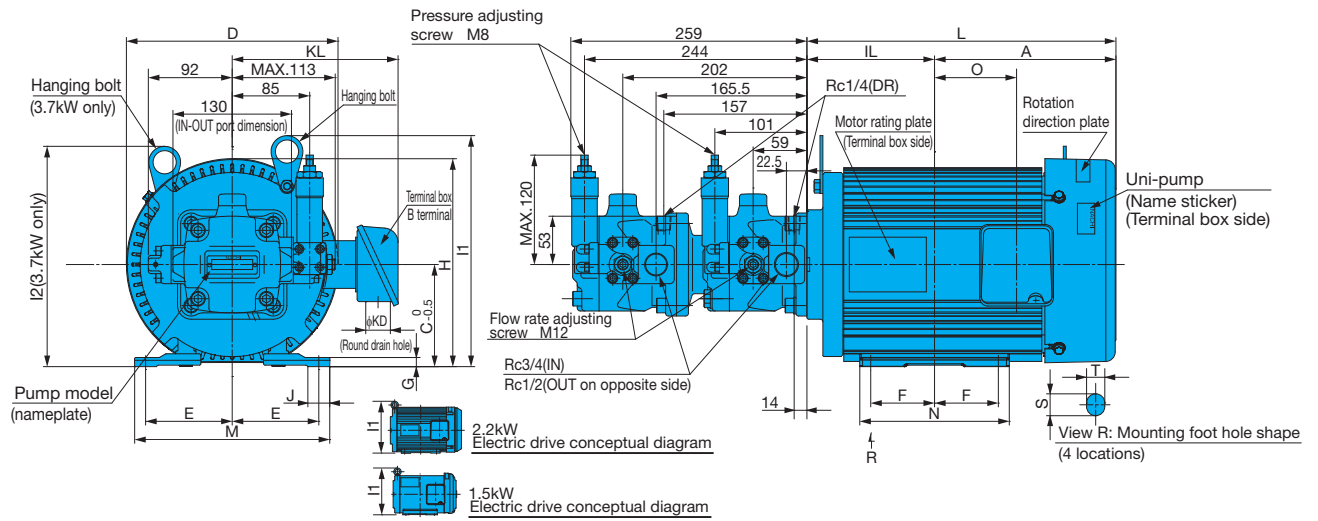
UVC-2A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg		
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	SxT	φKD	KL				O	
UVC-2A-A2-2.2-4-40	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	61	
UVC-2A-A3-2.2-4-40																						
UVC-2A-A2-3.7-4-40																						
UVC-2A-A3-3.7-4-40	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	65	
UVC-2A-2A2-3.7-4-40																						
UVC-2A-2A3-3.7-4-40																						

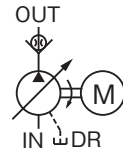
1. Standard drive motor is the fully enclosed fan-cooled F type.
2. Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
3. Standard terminal box is B terminal (right side viewed from pump).
4. See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).

UVC-11A



Uni-pump	Motor Dimensions [mm]																	Frame No.	Output kW (4 poles)	Weight kg		
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	S×T	φKD	KL				O	
UVC-11A-A2-A2-1.5-4-40																				90L	1.5	42
UVC-11A-A2-A3-1.5-4-40	160.5	118.5	90	183	70	62.5	4.4	183	204	-	22	279	165	152.5	16×10	27	142	68	90L	1.5	42	
UVC-11A-A3-A3-1.5-4-40																				100L	2.2	56
UVC-11A-A2-A2-2.2-4-40																				100L	2.2	56
UVC-11A-A3-A3-2.2-4-40	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14×12	27	153	83	100L	2.2	56	
UVC-11A-2A2-2A2-2.2-4-40																				112M	3.7	60
UVC-11A-A2-A2-3.7-4-40																				112M	3.7	60
UVC-11A-A3-A3-3.7-4-40	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14×12	27	182	90	112M	3.7	60	
UVC-11A-2A2-2A2-3.7-4-40																				112M	3.7	60
UVC-11A-2A2-2A3-3.7-4-40																				112M	3.7	60

- Standard drive motor is the fully enclosed fan-cooled F type.
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
- Standard terminal box is B terminal (right side viewed from pump).
- See page A-21 for the characteristics of the drive motor for the unipump (domestic standard 3 rating).



UVN Series Variable Volume Vane Uni-pump (NSP Uni-pump)

3 to 26cm³/rev
8MPa{81.6kgf/cm²}

Features

1. Energy efficient high performance

All the performance of a vane pump, right from the low pressure range, is enhanced even further by eliminating the external drain and optimizing the pressure balance, creating a design that generates little heat.

The result is a pump that contributes to the energy efficiency of the mother machine, as well as to process precision.

2. Lightweight, compact design

The pump and motor are designed for exclusive uni-pump use, making them lightweight, compact, easy to handle, and suitable for a wide range of applications.

3. Low noise, long life

The pump and motor shaft are linked by a joint, which minimizes noise by eliminating the effects of shaft vibration and an off-center shaft.

The coupling is constructed to allow constant lubrication, for friction-free long life.

Specifications

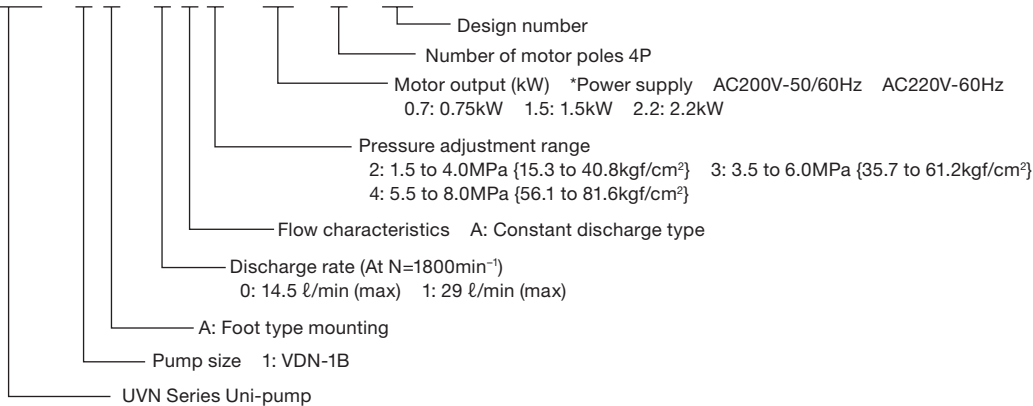
Model No.	Pump Capacity cm ³ /rev	Pressure Adjustment Range MPa{kgf/cm ² }	No-load Discharge Rate ℓ/min	
			50Hz	60Hz
UVN-1A-0A2- ^{0.7} / _{1.5} -4-12	8.1	1.5 to 4.0 {15.3 to 40.8}	12	14.5
UVN-1A-0A3- ^{0.7} / _{1.5} -4-12		3.5 to 6.0 {35.7 to 61.2}		
UVN-1A-0A4- ^{0.7} / _{1.5} -4-12		5.5 to 8.0 {56.1 to 81.6}		
UVN-1A-1A2- ^{1.5} / _{2.2} -4-12	16.1	1.5 to 4.0 {15.3 to 40.8}	24	29
UVN-1A-1A3- ^{1.5} / _{2.2} -4-12		3.5 to 6.0 {35.7 to 61.2}		
UVN-1A-1A4- ^{1.5} / _{2.2} -4-12		5.5 to 8.0 {56.1 to 81.6}		
UVN-1A-2A2- ^{2.2} / _{3.7} -4-30	26.0	2.0 to 4.0 {20.4 to 40.7}	39	46
UVN-1A-2A3- ^{2.2} / _{3.7} -4-30		3.5 to 6.0 {35.7 to 61.2}		
UVN-1A-2A4-3.7-4-30		5.5 to 7.0 {56.1 to 71.4}		

Note1) Contact your agent for combinations other than those noted above.

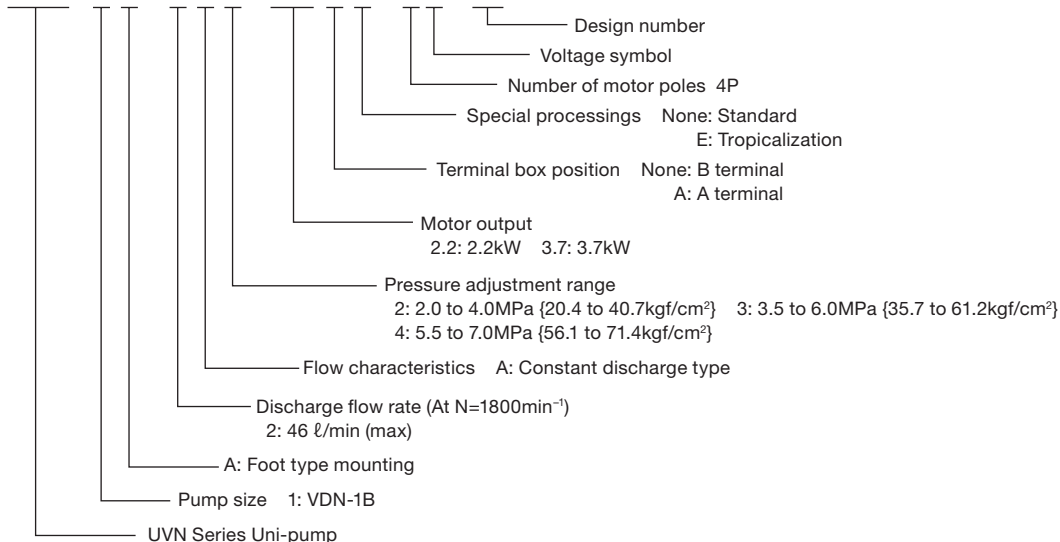
Note2) Due to the change of designs from 11 to 12, 20 to 30, the color of paint is changed to black.

Explanation of model No.

UVN - 1 A - 1 A 4 - 1.5 - 4 - 12



UVN -1 A - 2 A 3 - 3.7 A E - 4 * - 30



● Handling

1. Installation and Piping Precautions

- ① Provide a mounting base of sufficient rigidity, and install so that the pump shaft is oriented horizontally.
- ② Make sure the flow rate of the suction piping is no more than 2m/s, and that the suction pressure at the pump suction port is in the range of -0.03 to +0.03MPa.
- ③ Drain piping must be direct piping up to a point that is below the tank fluid level, and back pressure due to pipe resistance should not exceed 0.01MPa.
Provide a suction strainer with a filtering grade of about 100 μm (150 mesh).

2. Running Precautions

- ① The direction of rotation is clockwise (rightward) when viewed from the motor fan side.
- ② At startup, repeat the inching operation with the pump discharge side at no-load to prime the pump and bleed air from the pump and suction piping. (This pump has no fluid supply port.)
- ③ Equip an air bleed valve in circuits where it is difficult to bleed air before startup.
- ④ Make sure the maximum peak pressure (setting pressure + surge pressure) during operation does not exceed 14MPa.
Refer to the following piping conditions as a guideline to keep the maximum peak pressure below 14 MPa.
1/2" x 2 m rubber hose (Discharge rate 0; Type 1 14MPa, Type 2 13MPa) (pipe volume: approximately 250 cm³)
- ⑤ Install a relief valve to cut surges in the circuit if pressure exceeds 14 MPa.

Note) The maximum peak pressure of the discharge rate Type 2 is 13MPa.

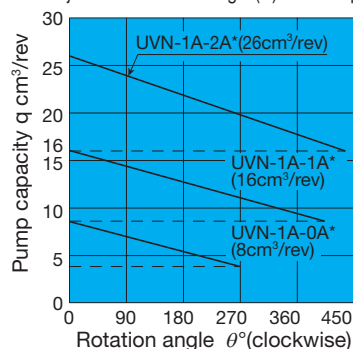
3. Management of Hydraulic Operating Fluid

- ① Use only good-quality hydraulic operating fluid with a kinematic viscosity at a oil temperature of 40°C within the range of 30 to 50mm²/sec (30 to 50cSt). Normally, you should use an R&O type and wear-resistant type of ISO VG32 or 46, or equivalent.
- ② The operating temperature range is 15 to 60°C. When the oil temperature at startup is 15°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 15°C. Use the pump in an area where the temperature is within the range of 10 to 40°C.
- ③ For the return line to the tank, use a 25μm line filter.
- ④ Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water, foreign matter, and other oil, and watch out for discoloration.

4. Setting the Pressure and Discharge Rate

- ① When adjusting pressure, pressure is increased by clockwise (rightward) rotation of the adjusting screw and decreased by counterclockwise (leftward) rotation. After adjustment is complete, securely tighten the lock nut.
- ② Turn adjustment screw right to decrease or left to increase volume of discharge. Refer to guidelines in the following diagram for the relationship of the non-load volume of discharge and the position of the flow adjustment screw.

Flow Adjustment Rotation Angle (θ) and Pump Capacity (q)



Note) The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken line shows the flow volume adjustment range lower limit value.

After adjustment is complete, securely tighten the lock nut.

- ③ Factory Default P-Q Settings (Standard Model)
 - Flow Rate Setting = Maximum flow rate for model as indicated in the catalog
 - Pressure Setting = Pressure shown in table below

Factory Default Pressure Settings MPa(kgf/cm ²)
2 : 3.5 {35.7}
3 : 5.0 {51.0}
4 : 7.0 {71.4}

- ④ All adjustments, except the flow volume adjusting screw, are precision adjusted at the factory during assembly, do not adjust them.

(Do not make any adjustments other than the pressure adjustment screw and the flow rate adjusting screw.)

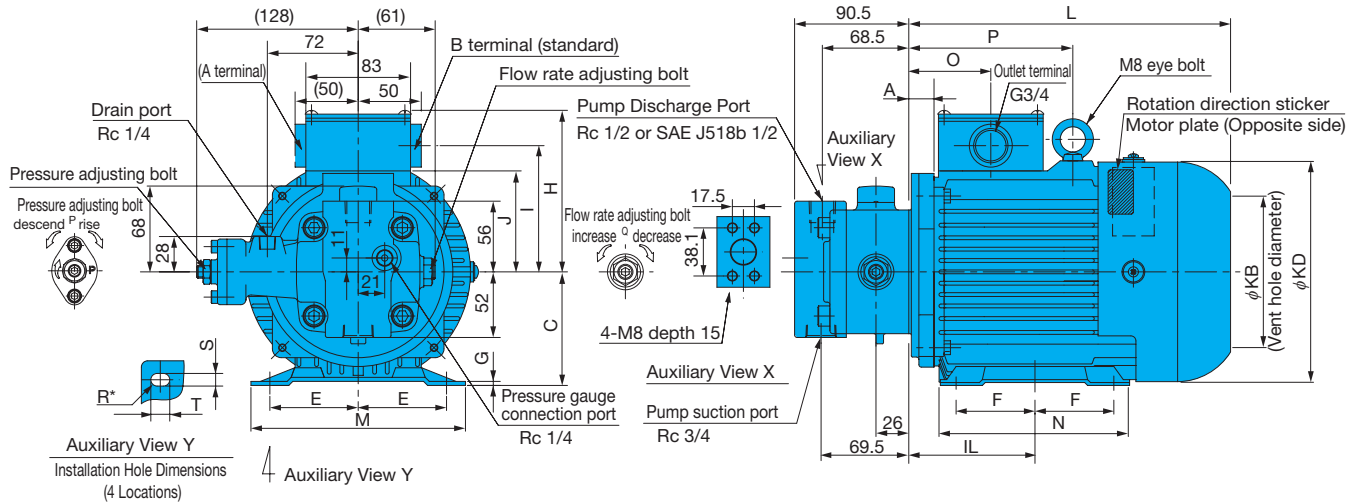
Note) The values indicated above are at maximum pump discharge volume with the flow volume adjusting screw at the 0° position. The broken lines show the flow volume adjustment range lower limit value.

● Inverter Drive Precautions

- ① Set the revolution speed within the range of the pump specification revolution speed.
- ② Changing the revolution speed may also affect the pump performance curves. Before using the inverter, check if the pressure and motor load factor are within the range of use.

Installation Dimension Drawings

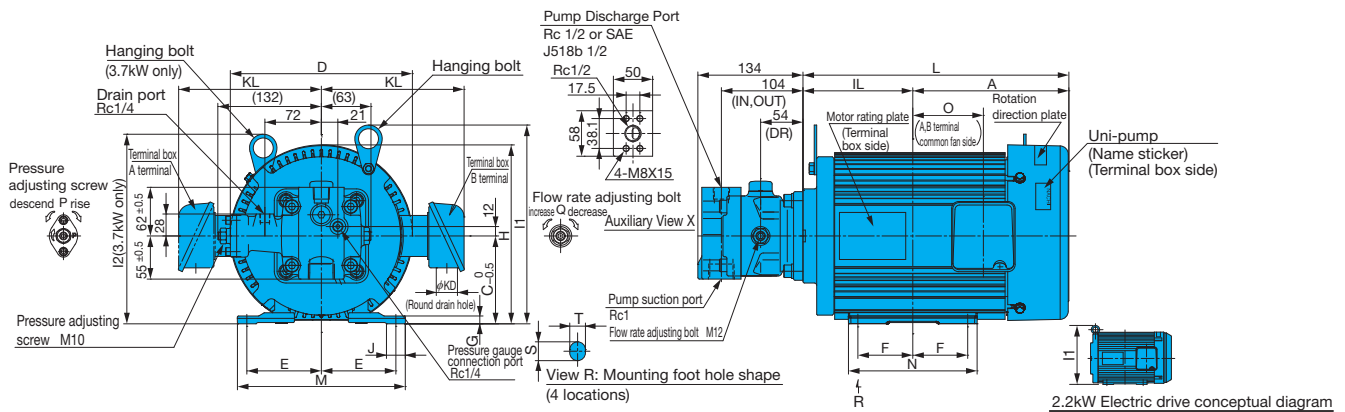
Installation method is the same as design number 10D (old design).



Model No.	Output - Poles (kW-4P)	Motor Dimensions (mm)																	Weight kg	
		A	IL	C	φKD	E	F	G	H	J	L	M	N	TxS	R*	φKB	O	P		I
UVN-1A- ₁ ⁰ A*-0.7*-4-12	0.75-4	20	90	80	157	62.5	50	2.3	120	72	230	155	120	15x10	R5	110	65	130	92	19
UVN-1A- ₁ ⁰ A*-1.5*-4-12	1.5-4	20	100	90	175	70	62.5	3.2	128	80	255	170	150	15x10	R5	120	65	130	100	23
UVN-1A- ₁ ⁰ A*-2.2*-4-12	2.2-4	20	110	100	195	80	70	3.2	138	90	285	200	165	17x12	R6	134	65	135	110	30

- Pump Capacity and Motor Output Category Combinations -

	0.75kW	1.5kW	2.2kW
0A*	○	○	○
1A*	○	○	○



Model No.	Motor Dimensions [mm]																	Frame No.	Output [kW] (4 poles)	Weight [kg]	
	A	IL	C	D	E	F	G	H	I1	I2	J	L	M	N	SxT	φKD	KL				O
UVN-1A-2A*-2.2*-4*-30	179	133	100	206	80	70	7	203	226	-	39	312	206	170	14x12	27	153	83	100L	2.2	46
UVN-1A-2A*-3.7*-4*-30	199	140	112	233	95	70	10	228	253	242	24	339	214	164	14x12	27	182	90	112M	3.7	50

- Standard drive motor is the fully enclosed fan-cooled E type.
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.
- Standard terminal box is B terminal (right side viewed from pump).

-Pump Pressure Classification and Motor Output Combinations-

	2.2kW	3.7kW
2A2	○	○
2A3	○	○
2A4	○	○

Characteristics of drive motor for unipump (domestic standard 3 rating)

UVN-1A-0A*

Output kW	Poles	Model Number	Voltage [V]	Frequency [Hz]	Current rating [A]	RPM rating [min ⁻¹]	Heat resistance
0.75	4	The drive motor is specialized for the unipump and is not a specific model.	200	50	4.3	1440	E
			200	60	3.6	1730	
			220	60	3.6	1745	
1.5	4		200	50	7.3	1440	E
			200	60	6.4	1730	
			220	60	6.2	1740	
2.2	4		200	50	10.3	1450	E
			200	60	9.2	1745	
			220	60	8.9	1755	

UVN-1A-2A*

Output kW	Poles	Model Number	Voltage [V]	Frequency [Hz]	Current rating [A]	RPM rating [min ⁻¹]	Heat resistance	
2.2	4	VAEA-1A4*22-B	200	50	9.5	1460	F	
			200	60	8.8	1750		
			220	60	8.5	1760		
3.7	4		VAEA-1A4*37-B	200	50	15.4	1460	F
				200	60	14.3	1760	
				220	60	13.5	1760	

Performance Curves

UVN-1A-*A*-*-4-12

Operating Fluid: ISO VG 32

Oil temperature: 40°C

Motor selection curves

The area under a motor output curve in the graph below is the operating range for that motor under the rated output for that motor.

Example:

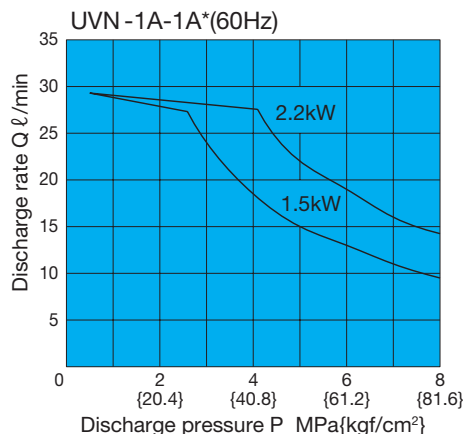
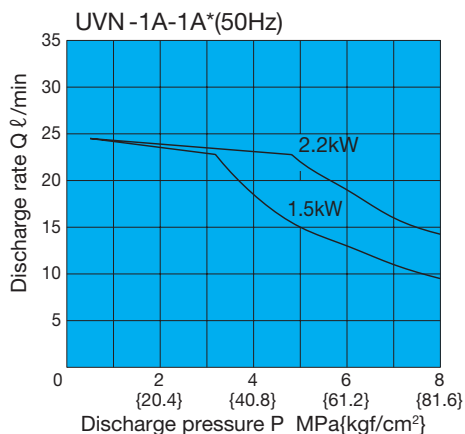
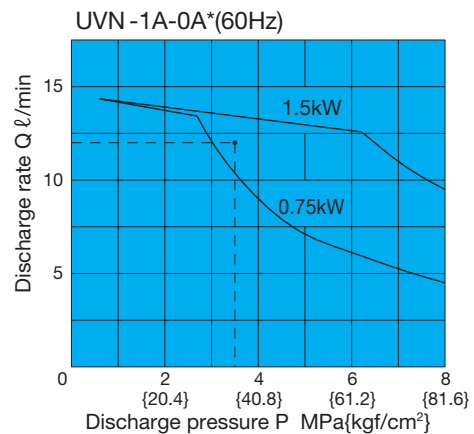
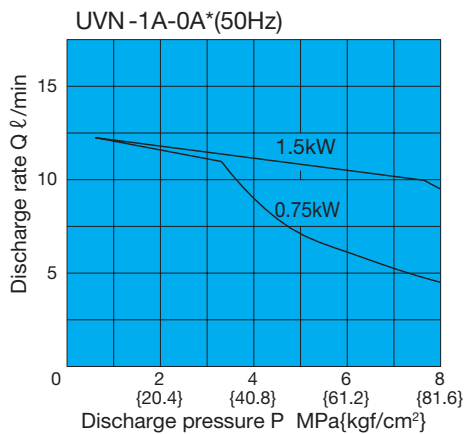
To find the motor that can produce pressure of 3.5MPa and a discharge rate of 12ℓ/min.

Selection Process

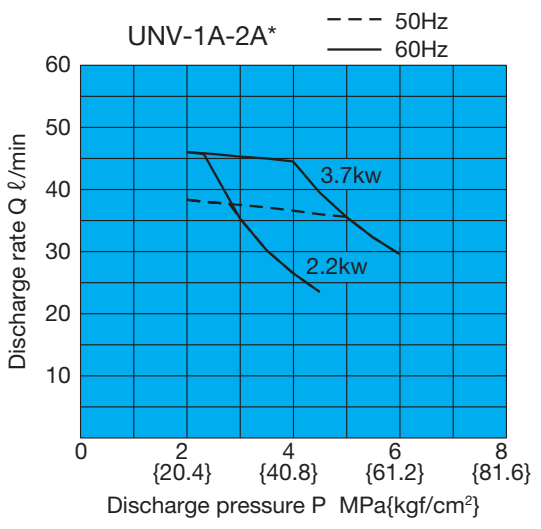
Since the intersection of the two broken lines from a pressure of 3.5MPa and discharge rate of 12ℓ/min intersect in the area under the 1.5kW curve, it means that a 1.5kW motor should be used.

* Select a uni-pump that has a pressure and flow rate that is within the range of the drive so that the drive will not overload.

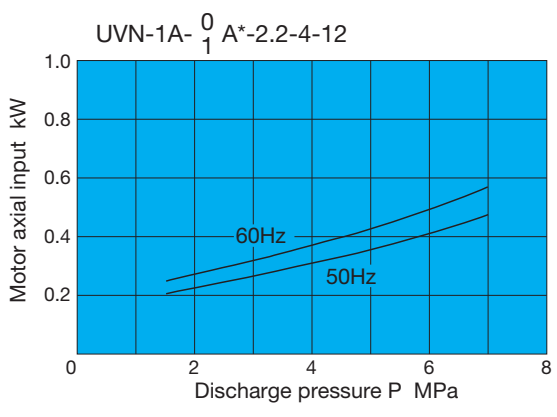
* When the startup current of the uni-pump becomes higher for the IE1 motor, breakers may need to be changed.



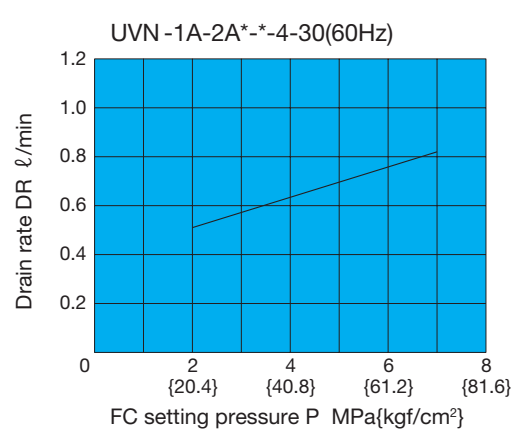
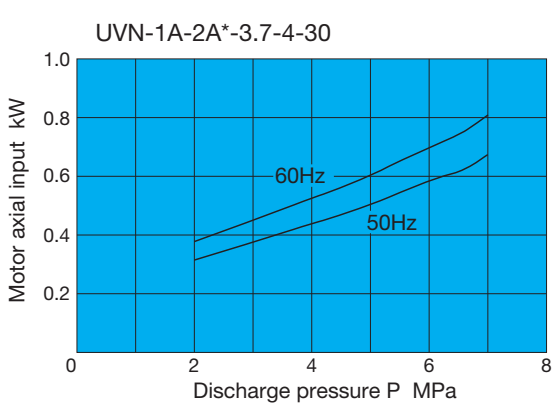
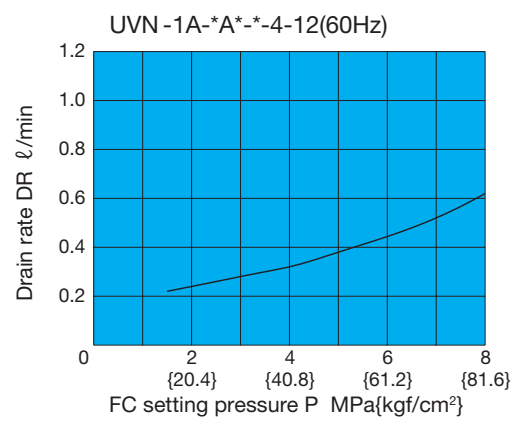
Motor selection curves (26cm³/rev)

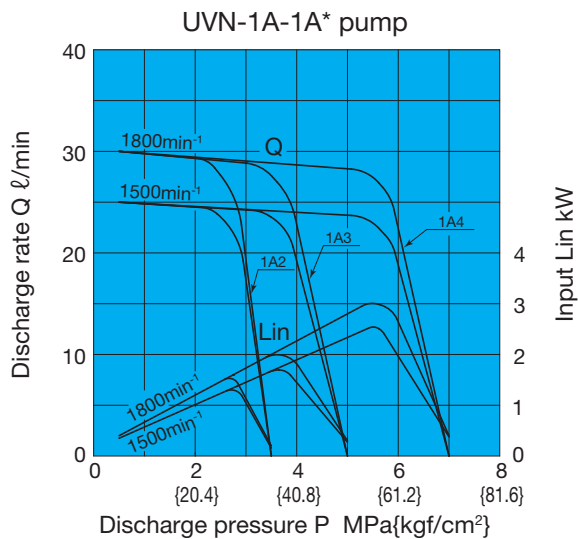
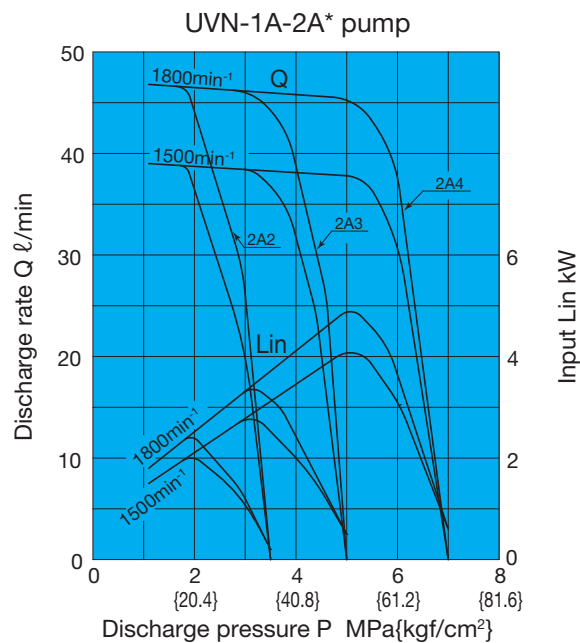
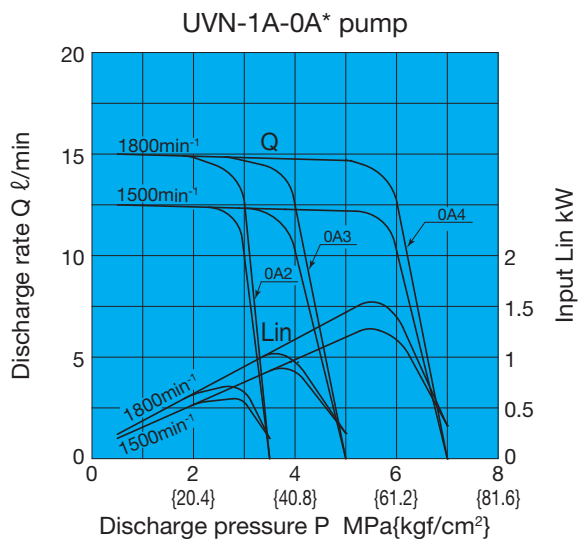


Motor Power Loss at Full Cutoff

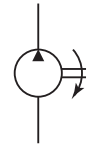


DR Volume a Full Cutoff





*The pressure – flow rate characteristics are the characteristics for individual UVN pumps.
The pressure and flow rate must be within the output range of the motor.
See page B-43 for the output ranges of drive motors.



IPH Series IP Pump

3.6 to 125.9cm³/rev
30MPa

❖ This is a new design series in which all pump types are installation compatible with previous designs. Note, however, that there is no longer compatibility for some of the seal components between the IPH-3 and IPH-4 sizes and design numbers 10 and 12.

Features

- ① A patented axial and radial pressure loading system provides high efficiency and generates pressures up to 30MPa {306kgf/cm²}.
- ② Outstanding durability and very long life.
- ③ A modified involute short-tooth gear enables internal gearing for greatly reduced pulsation and noise, and exceptionally quiet operation.
- ④ A simple structure makes maintenance and inspection easier.

Specifications

Model No.	Capacity cm ³ /rev	Rated Voltage MPa	Maximum Operating Pressure MPa{kgf/cm ² }	Minimum Revolution Speed min ⁻¹	Maximum Revolution Speed min ⁻¹	Weight kg	
						Type A	Type B
IPH-2A(B)- 3.5-11	3.60	25 {255}	30 {306}	600	2000	4.4	2.4
	5					4.5	2.5
	6.5					4.6	2.6
	8					4.8	2.8
IPH-3A(B)- 10-20	10.2	25 {255}	30 {306}	600	2000	10.5	4.8
	13					10.7	5.0
	16					11.0	5.3
IPH-4A(B)- 20-20	20.7	25 {255}	30 {306}	500	2000	15.2	9.5
	25					15.7	10.0
	32					16.2	10.5
IPH-5A(B)- 40-21(11)	40.8	25 {255}	30 {306}	400	2000	32.0	19.0
	50					33.0	20.0
	64					34.0	21.0
IPH-6A(B)- 80-21(11)	81.3	25 {255}	30 {306}	300	2000	62.0	39.0
	100					64.0	41.0
	125					66.0	43.0

- Note) 1.Capacity: Logical discharge rate per rotation.
 2.Suction Pressure: +0.02 to +0.3MPa {-0.2 to +0.3kgf/cm²}
 3.Maximum working pressure shown here is the pressure limit when there are frequent pressure changes.
 4.Avoid installation with the suction port towards the bottom of the pump.
 5.Specify using the model number format shown below when pipe flanging is required.

● Handling

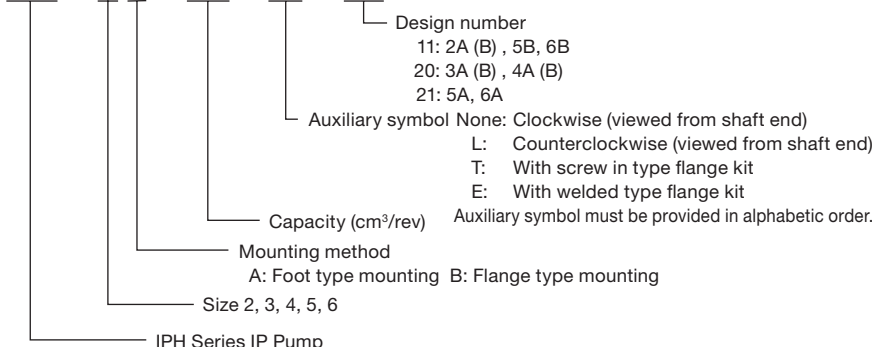
- ① For the hydraulic operating fluid, use an R&O type and wear-resistant type of ISO VG32 to 68 or equivalent (viscosity index of at least 90). Use hydraulic operating fluid that provides kinematic viscosity during operation in the range of 20 to 150mm²/s.
- ② The operating temperature range is 5 to 65°C. When the oil temperature at startup is 5°C or less, perform a warm-up operation at low pressure until the oil temperature reaches 5°C. Use the

pump in an area where the temperature is within the range of 0 to 60°C.

- ③ Suction pressure is -0.02 to +0.03MPa (-0.2 to +0.3kgf/cm²), and the suction port flow rate should be to greater than 2m/sec.
- ④ Avoid pulley, gear, and other drive systems that impart a radial or thrust load on the end of the pump shaft.
- ⑤ Mount the hydraulic pump so its pump shaft is oriented horizontally. Provide a suction strainer with a filtering grade of about 100μm (150 mesh). For the return line to the tank, use a 25μm line filter.
- ⑥ Manage hydraulic operating fluid so contamination is maintained at class NAS10 or lower. Take care to avoid contamination with water and other foreign matter, and watch out for discoloration. Whitish fluid indicates that air has contaminated the fluid, and brownish fluid indicates the fluid is dirty.
- ⑦ Operate within the RPM range in the catalog for the minimum RPM of the pump. Unload the pump's load pressure to operate at variable speeds. Condition of inflow piping must produce as little inflow load pressure as possible to minimize effect of cavitation.

Explanation of model No.

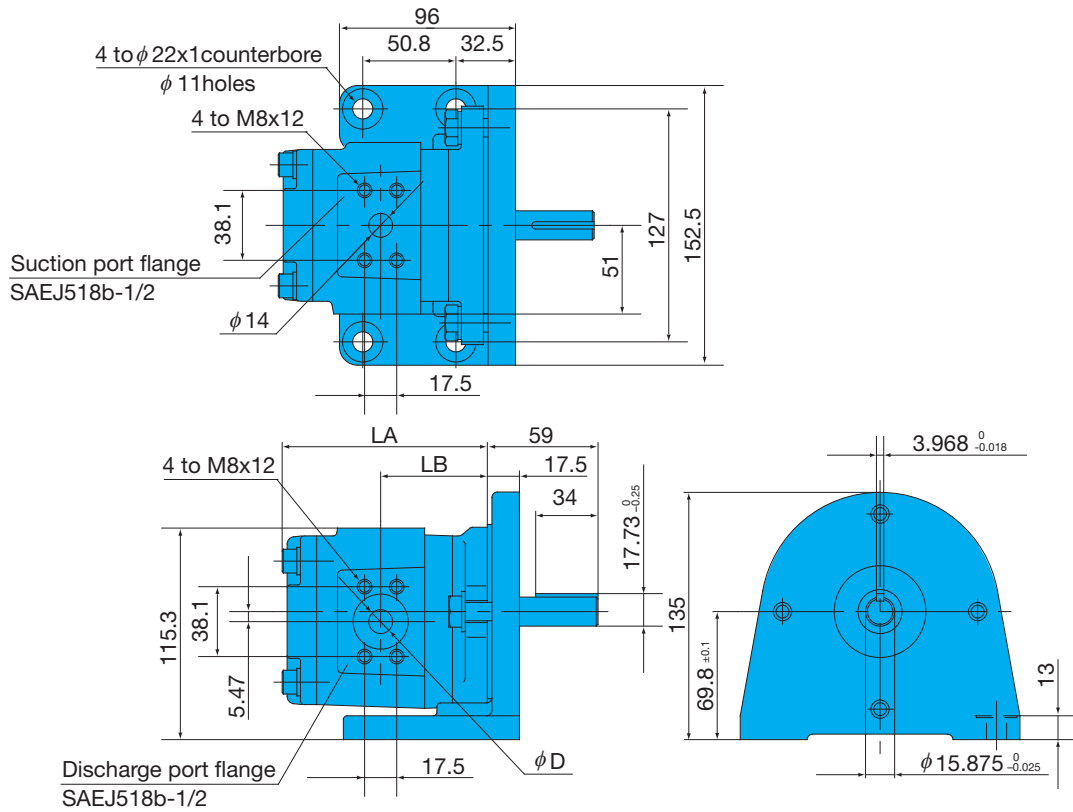
IPH - 4 B - 25 - LT - 20



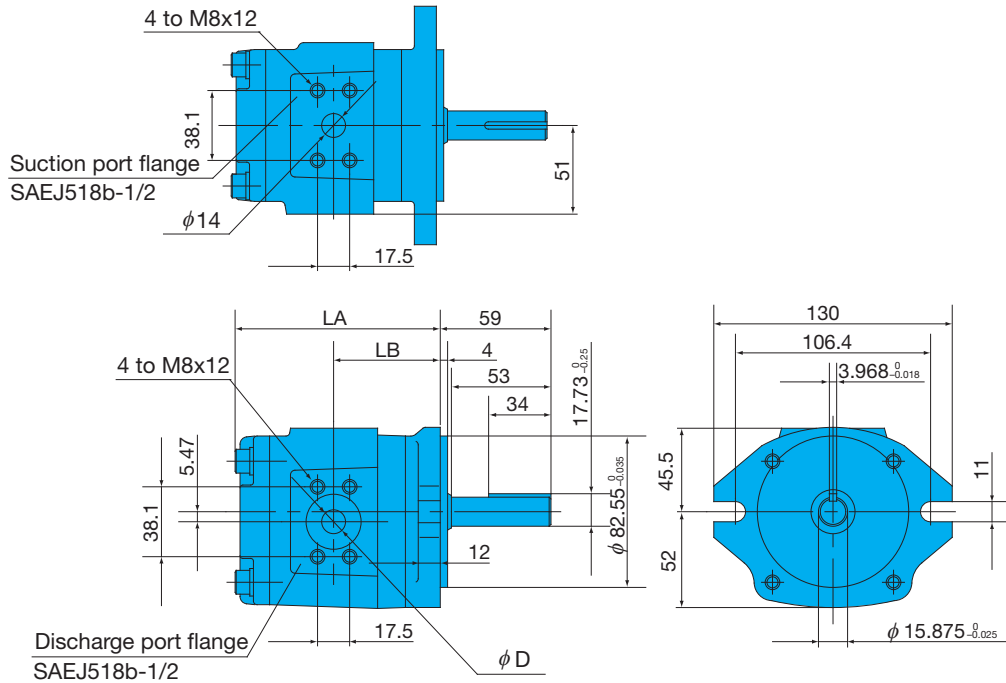
(Continued on following page)

Installation Dimension Drawings

IPH-2A-*-11 (Foot Mounting, Clockwise Rotation)



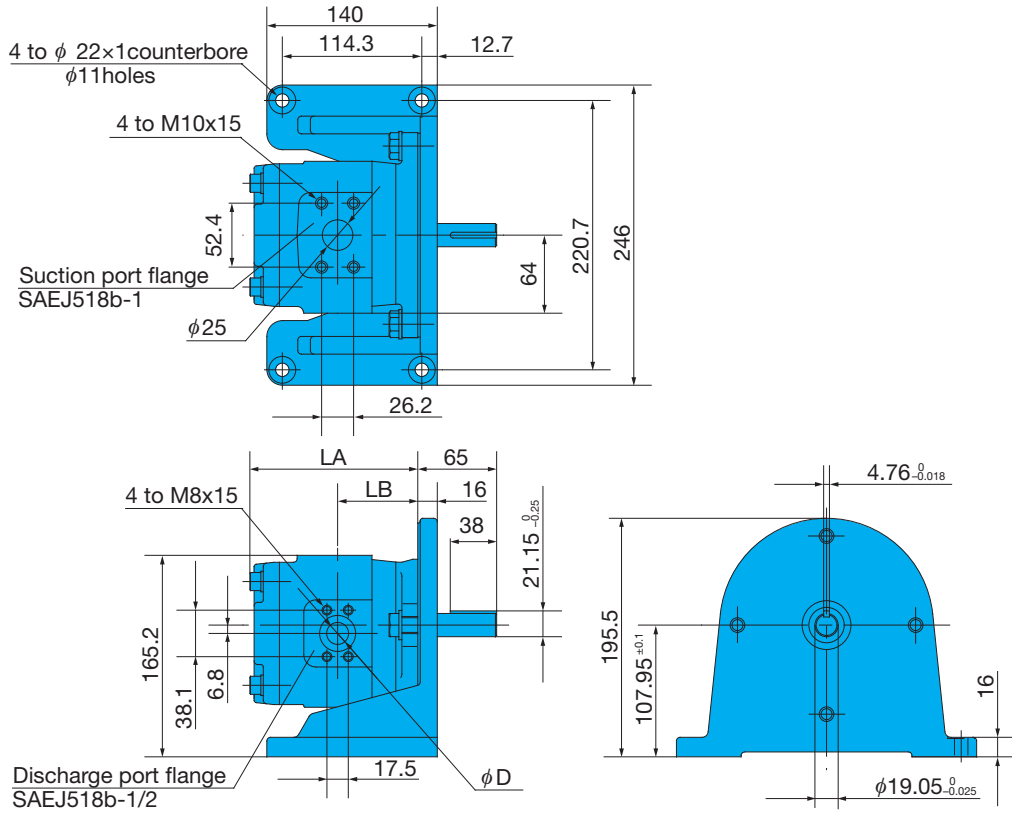
IPH-2B-*-11 (Flange Mounting, Clockwise Rotation)



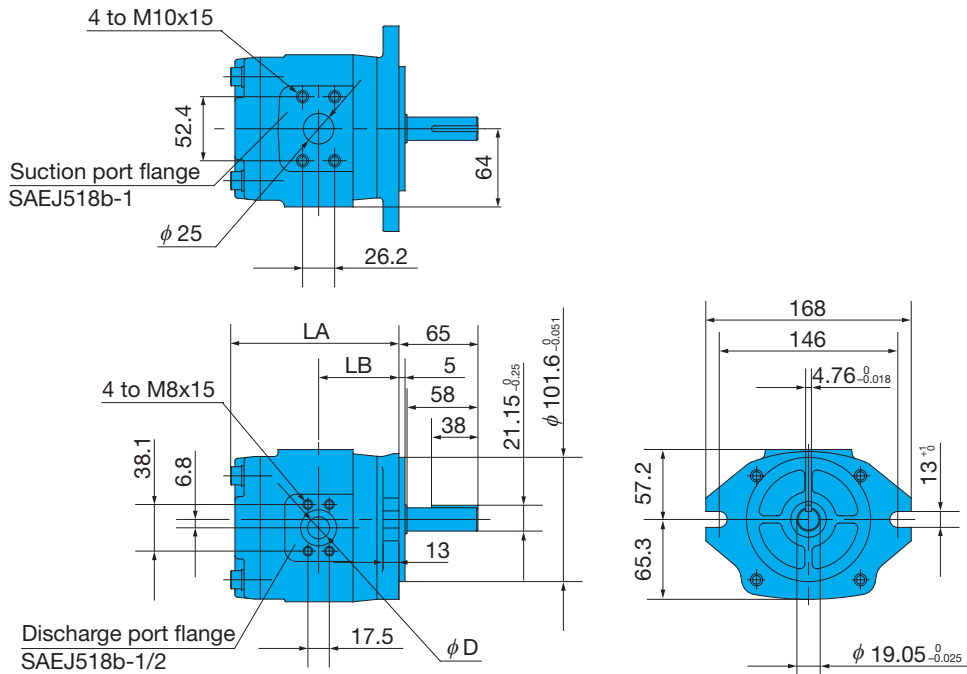
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-2*-3.5-*-11	107	51.0	8.9
IPH-2*-5-*-11	112	53.5	11
IPH-2*-6.5-*-11	116	55.5	12
IPH-2*-8-*-11	121	58.0	13

Note) IPH-2A (B)*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-3A-*-20 (Foot Mounting, Clockwise Rotation)

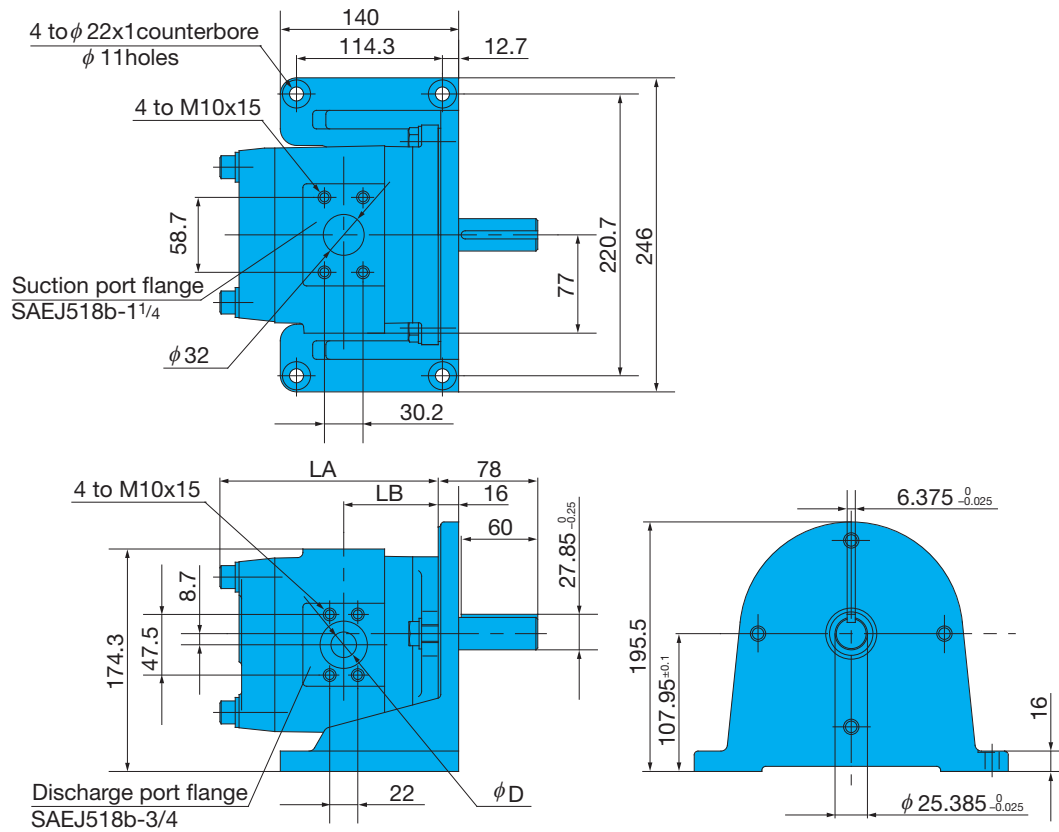
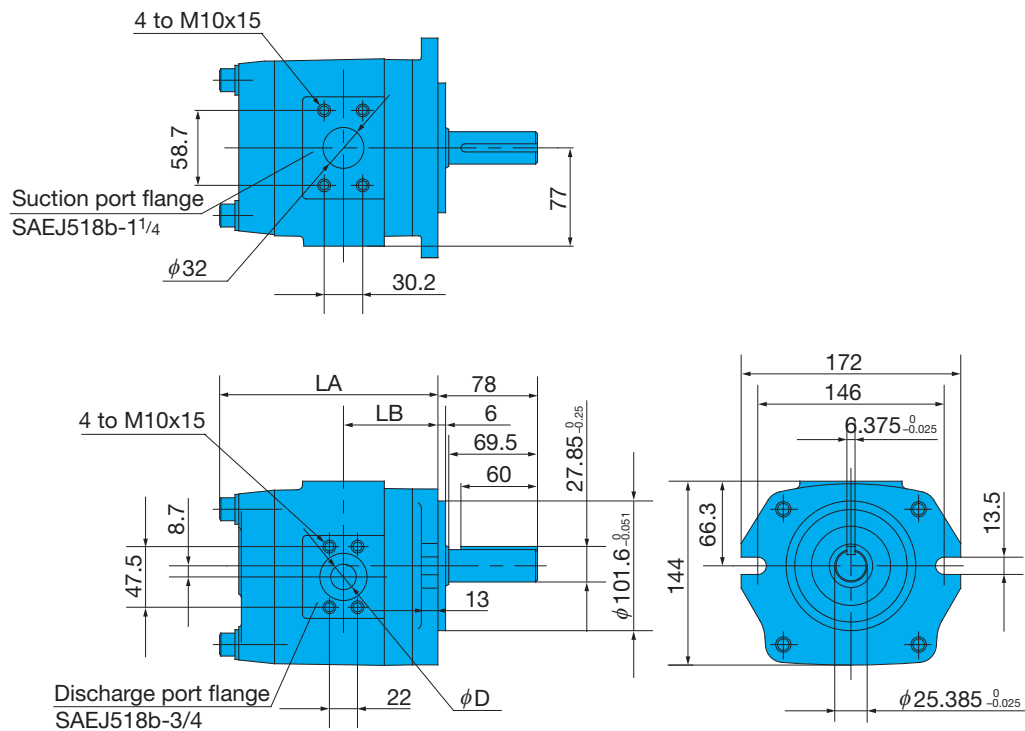


IPH-3B-*-20 (Flange Mounting, Clockwise Rotation)



Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-3*-10-*-20	128.5	60.0	14
IPH-3*-13-*-20	134.5	63.0	17
IPH-3*-16-*-20	139.5	65.5	18

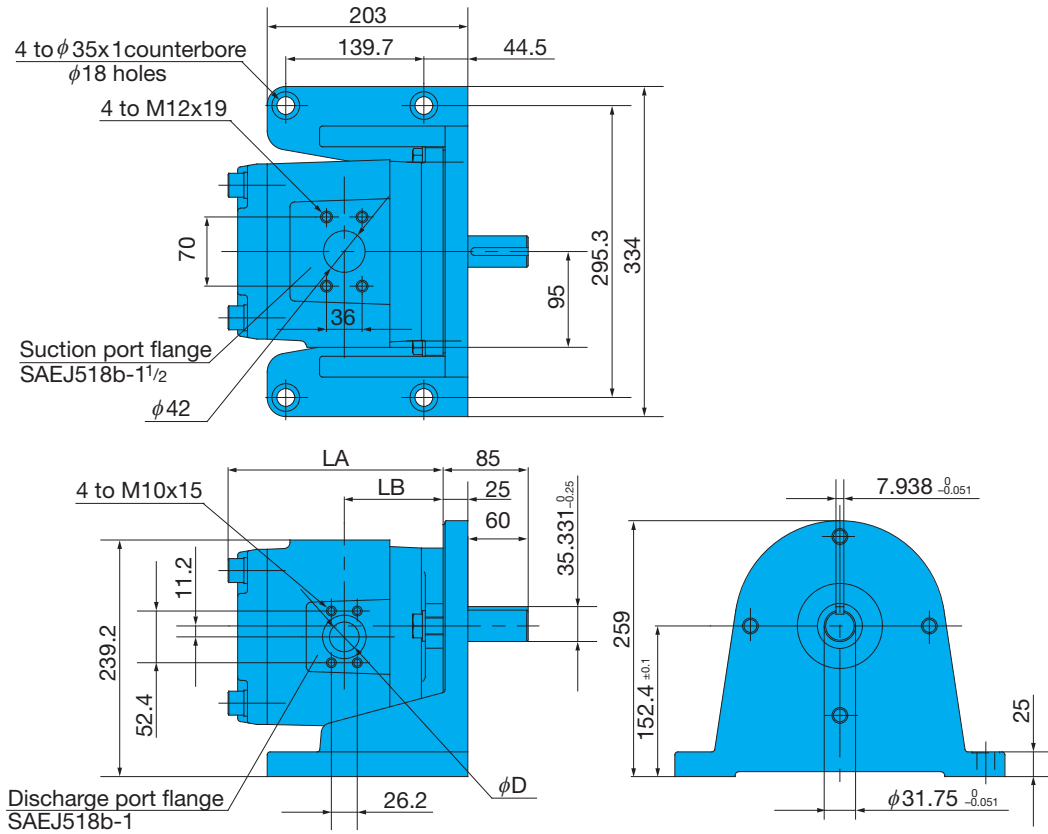
Note) IPH-3A (B)-*-L-20 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-4A-*-20 (Foot Mounting, Clockwise Rotation)

IPH-4B-*-20 (Flange Mounting, Clockwise Rotation)


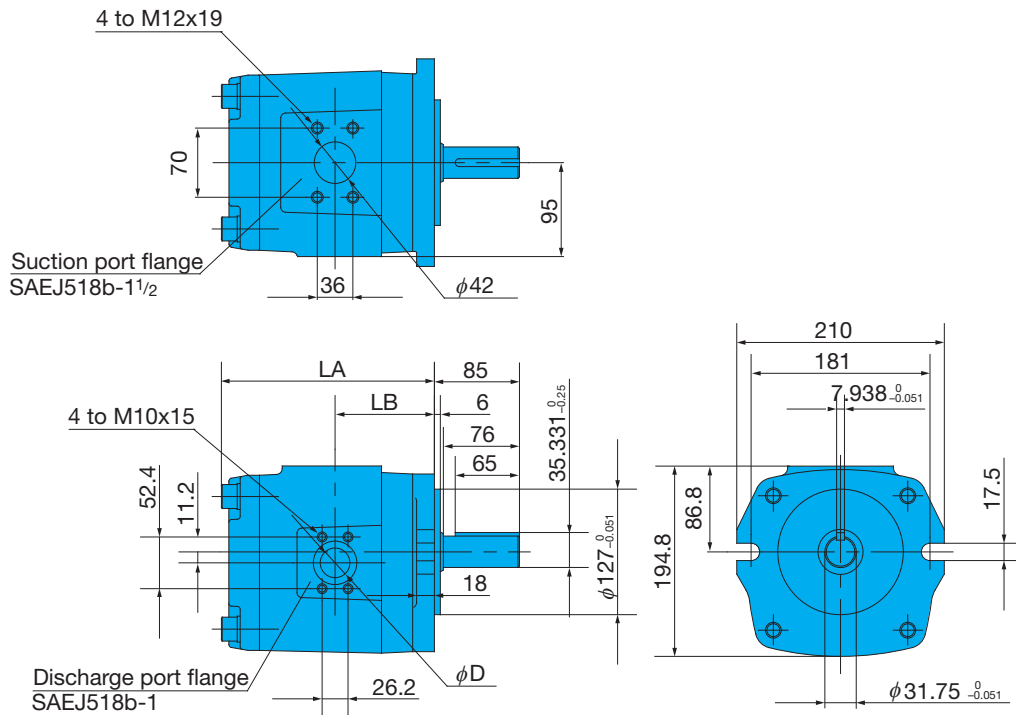
Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-4*-20*-20	164.5	71	18
IPH-4*-25*-20	170.5	74	20
IPH-4*-32*-20	178.5	78	24

Note) IPH-4A (B)-*-L-20 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-5A-*-21 (Foot Mounting, Clockwise Rotation)

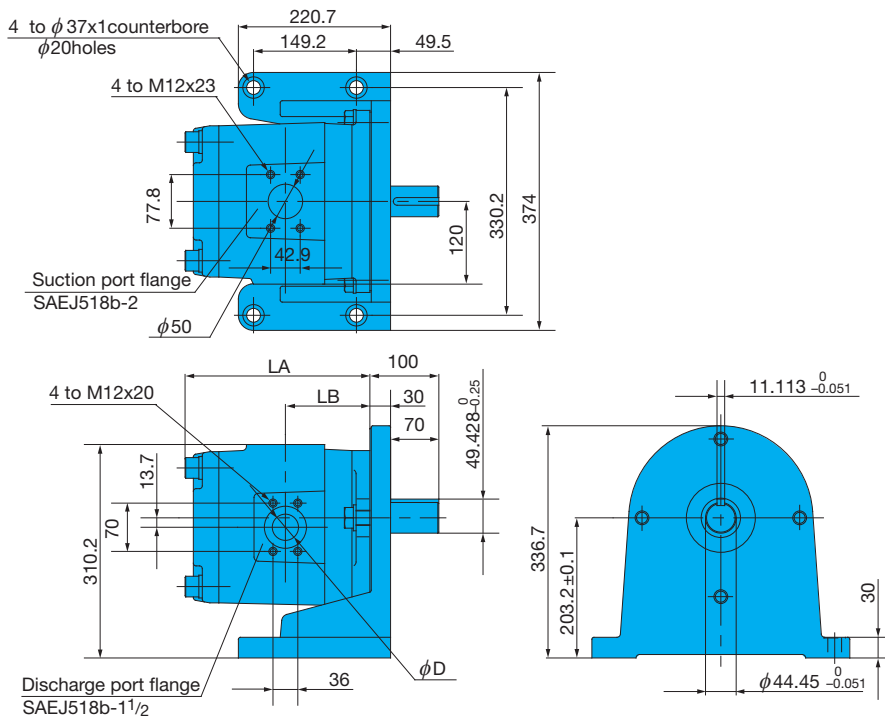
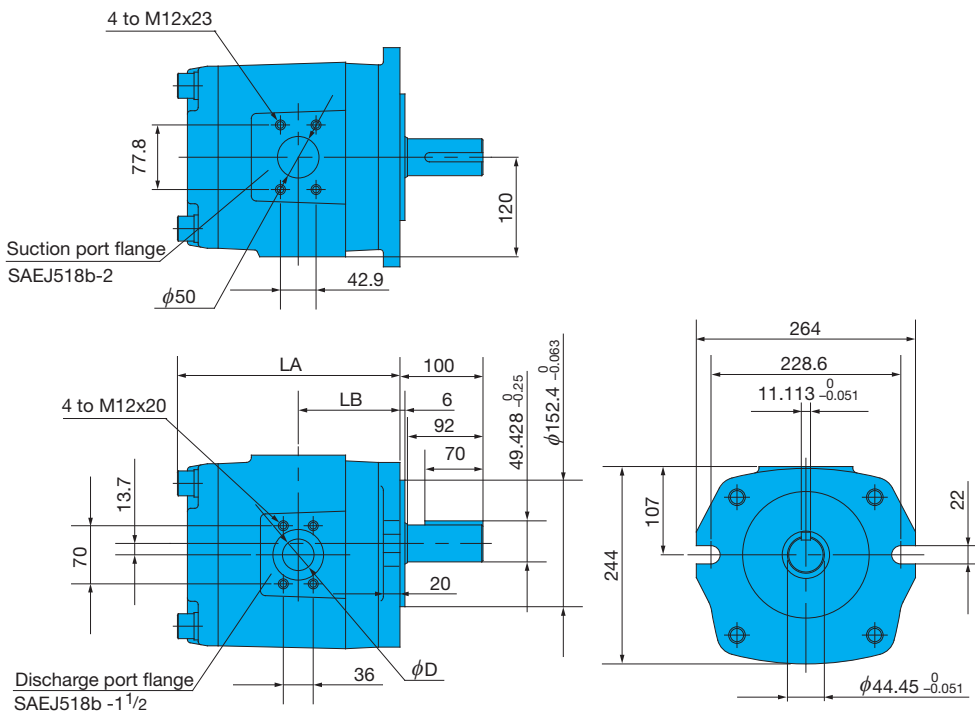


IPH-5B-*-11 (Flange Mounting, Clockwise Rotation)



Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-5*-40-*-21(11)	201.5	91.0	24
IPH-5*-50-*-21(11)	208.5	94.5	26
IPH-5*-64-*-21(11)	218.5	99.5	28

Note) IPH-5A (B)-*-L-21 (11) (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

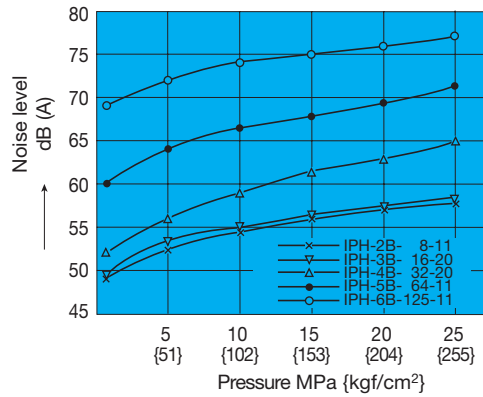
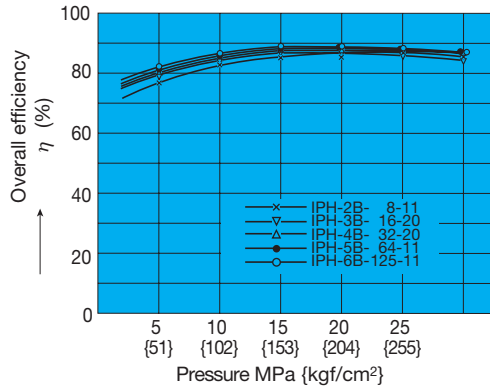
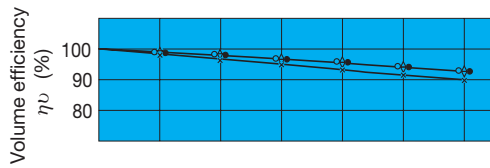
IPH-6A-*-21 (Foot Mounting, Clockwise Rotation)

IPH-6B-*-11 (Flange Mounting, Clockwise Rotation)


Model No.	Dimensions (mm)		
	LA	LB	ϕD
IPH-6*- 80-*-21(11)	241.5	111.5	32
IPH-6*-100-*-21(11)	251.5	116.5	36
IPH-6*-125-*-21(11)	263.5	122.5	38

Note) IPH-6A (B)-*-L-21 (11) (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

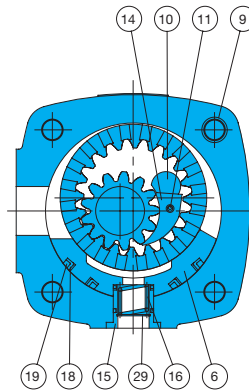
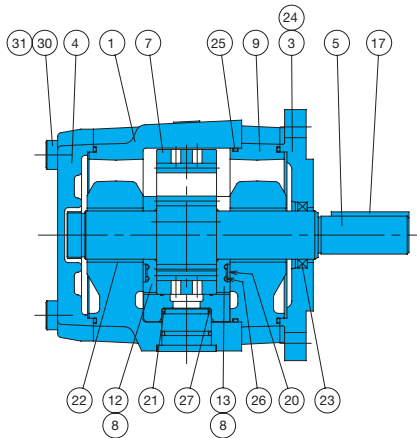
Performance Curves

Revolution Speed 1200min⁻¹
 Operating Hydraulic Fluid Viscosity 46mm²/s
 Representative Characteristics Under Above Conditions



Cross-sectional Drawings

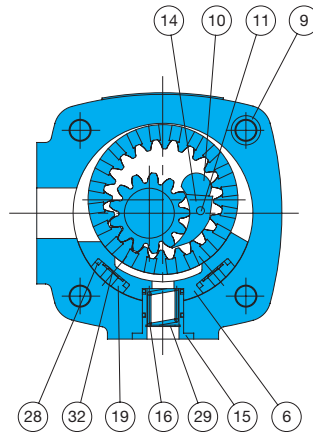
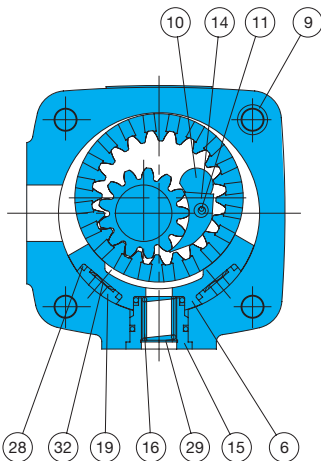
IPH-*B-*



Part No.	Part Name
1	Body -1
2	Body -2
3	Mounting
4	Rear cover
5	Pinion shaft
6	Radial piston
7	Internal gear
8	Bushing
9	Knock pin
10	Stopper pin
11	Spring pin (guide pin)
12	Axial plate -1
13	Axial plate -2
14	Feeler piece
15	Spring holder
16	Spring
17	Key
18	Radial seal
19	Radial backup ring
20	Axial backup ring
21	Backup ring
22	Bearing
23	Oil seal
24	Pin
25	O-ring
26	O-ring
27	O-ring
28	O-ring
29	Snap ring
30	Screw
31	Washer
32	Wave washer

Note) Drawings shown above are the IPH-5 and IPH-6.

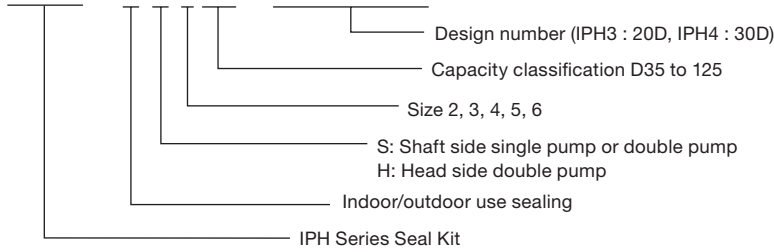
The lower left cross-sectional drawing is the IPH-4, the radial seal #18 was removed and a wave washer was added. The lower right cross-sectional drawing is the IPH-2 and IPH-3, the bushing #8 was removed, the spring pin #11 was replaced with a guide pin, and the radial seal #18 was removed and a wave washer #32 was added.



IPH Series Seal Kit

Understanding Seal Kit **IHAS - 2 S * *** - 10(20, 30)**

Model Numbers :



Seal Kit Number	Applicable Pump Model No.	Component Part Numbers							
		18	Q'ty	19	Q'ty	20	Q'ty	21	Q'ty
		Radial Seal		Radial Backup Ring		Axial Backup Ring		Backup ring	
IHAS-2S2D35-10	IPH-2A(B)-3.5-11			IH34J-102D35-1A	2	IH34J-202000	2	IH34J-402D35	1
2S2005-10	5			102005-1A	2	"	2	402005	1
2S2D65-10	6.5			102D65-1A	2	"	2	402D65	1
2S2008-10	8			102008-1A	2	"	2	402008	1
IHAS-2S3010-20	IPH-3A(B)-10-20			IH34J-103010-1A	2	IH34J-203000	2	IH34J-403010	1
2S3013-20	13			103013-1A	2	"	2	403013	1
2S3016-20	16			103016-1A	2	"	2	403016	1
IHAS-2S4020-30	IPH-4A(B)-20-20			IH34J-104020-2A	2	IH34J-204000-1A	2	IH34J-404020	1
2S4025-30	25			104025-2A	2	"	2	404025	1
2S4032-30	32			104032-2A	2	"	2	404032	1
IHAS-2S5040-10	IPH-5A(B)-40-21(11)	IH33J-105040-1A	2	IH34J-105040-1A	2	IH34J-205000	2	IH34J-405040	1
2S5050-10	50	105050-1A	2	105050-1A	2	"	2	405050	1
2S5064-10	64	105064-1A	2	105064-1A	2	"	2	405064	1
IHAS-2S6080-10	IPH-6A(B)-80-21(11)	IH33J-106080-1A	2	IH34J-106080-1A	2	IH34J-206000	2	IH34J-406080	1
2S6100-10	100	106100-1A	2	106100-1A	2	"	2	406100	1
2S6125-10	125	106125-1A	2	106125-1A	2	"	2	406125	1

Seal Kit Number	Component Part Numbers									
	23	Q'ty	25	Q'ty	26	Q'ty	27	Q'ty	28	Q'ty
	Oil seal		O-ring		O-ring		O-ring		O-ring	
IHAS-2S2D35-10	ISD-20328	1	R68x2	3	R23x2	2	R10x2	1	R10x2	2
2S2005-10	"	1	"	3	"	2	R12x2	1	R12x2	2
2S2D65-10	"	1	"	3	"	2	R14x2	1	R14x2	2
2S2008-10	"	1	"	3	"	2	R16x2	1	R16x2	2
IHAS-2S3010-20	ISD-25388	1	R86x2	3	R30x2	2	R15x2.5	1	R15x2.5	2
2S3013-20	"	1	"	3	"	2	R18x2.5	1	R18x2.5	2
2S3016-20	"	1	"	3	"	2	R20x2.5	1	R20x2.5	2
IHAS-2S4020-30	ISD-32458	1	R108x3	3	R38x2.5	2	R21x2.5	1	R21x2.5	2
2S4025-30	"	1	"	3	"	2	R23x3	1	R23x3	2
2S4032-30	"	1	"	3	"	2	R26x3	1	R26x3	2
IHAS-2S5040-10	ISD-40558	1	R140x3	3	R49x3	2	R26x3	1		
2S5050-10	"	1	"	3	"	2	R29x3.5	1		
2S5064-10	"	1	"	3	"	2	R33x3.5	1		
IHAS-2S6080-10	ISD-50659	1	R172x4	3	R60x3.5	2	R34x3.5	1		
2S6100-10	"	1	"	3	"	2	R38x4	1		
2S6125-10	"	1	"	3	"	2	R43x4	1		

Note) 1.Oil seals are manufactured by Nippon Oil Seal Industry Co. Ltd. (NOK).
 2.O-rings are not available through retail sources. Consult your agent for more information.



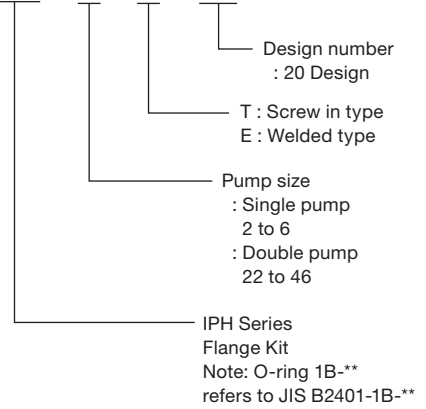
IPH Series Pipe Flange Kit

Understanding Flange Kit Model Numbers :

The pipe flange kit combines the flanges, bolts, washers, and O-rings required for each type of pump into a single kit.

The component parts table shows the screw in type flange kit. In the case of the welded type flange, the flange part number is IH03J-200040 (1 of IH03J-100040 changes to 2). All other included parts are the same.

IHF - 3 - T - 20



Screw in type Flange Kit model No.	Applicable Pump Model No.	IN Flange							
		Flange Part No.		Bolt		Washer		O-ring	
IHF-2-T-20	IPH-2A(B)-*-11	IH03J-100040	1	TH- 8x45	4	WS-B- 8	4	NBR-90 P22	1
IHF-3-T-20	IPH-3A(B)-*-20	IH03J-100080	1	TH-10x50	4	WS-B-10	4	NBR-90 G35	1
IHF-4-T-20	IPH-4A(B)-*-20	IH03J-100100	1	TH-10x55	4	"	4	NBR-90 G40	1
IHF-5-T-20	IPH-5A(B)-*-21(11)	IH03J-100120	1	TH-12x55	4	WS-B-12	4	NBR-90 G50	1
IHF-6-T-20	IPH-6A(B)-*-21(11)	IH03J-100160	1	TH-12x60	4	"	4	NBR-90 G60	1

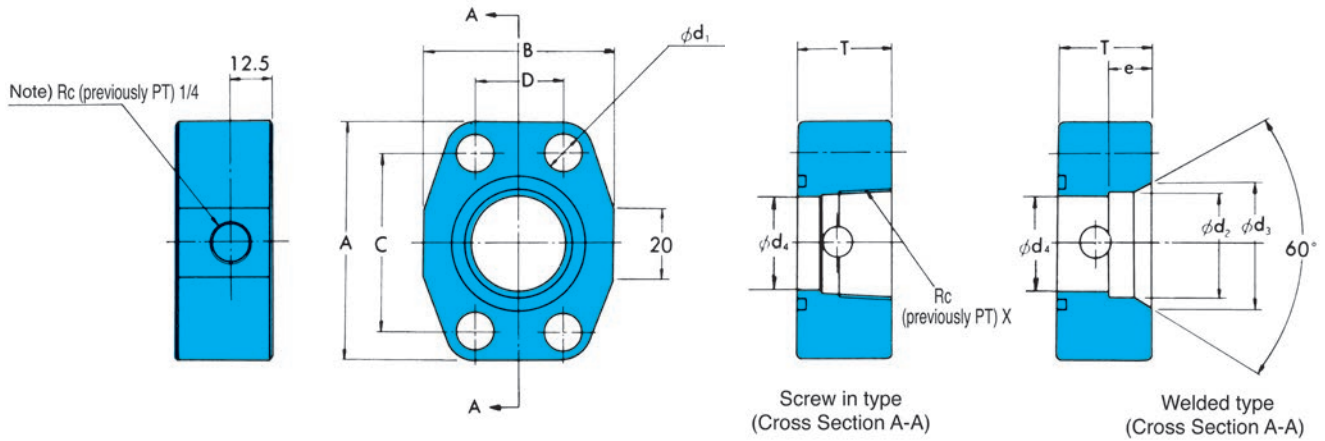
OUT Flange								Plug	
Flange Part No.		Bolt		Washer		O-ring			
IH03J-100040	1	TH- 8x45	4	WS-B- 8	4	NBR-90 P22	1	TPHA-1/4	2
IH03J-100040	1	TH- 8x45	4	"	4	NBR-90 P22	1	"	2
IH03J-100060	1	TH-10x50	4	WS-B-10	4	NBR-90 G30	1	"	1
IH03J-100080	1	TH-10x50	4	"	4	NBR-90 G35	1	"	2
IH03J-100120	1	TH-12x60	4	WS-B-12	4	NBR-90 G50	1	"	1

Note) 1. In the case of a double pump, the flange kit includes three flanges: one for the common IN port and two OUT port flanges. When using separate IN ports, use separate single pump flange kits, one each for the head side and the shaft side.
 Note) 2. There is no common IN port in the case of the double pump models IPH-55, IPH-56, and IPH-66, or a single IN port is used.

Screw in type Flange Kit model No.	Applicable Pump Model No.	IN Flange							
		Flange Part No.		Bolt		Washer		O-ring	
IHF-22-T-20	IPH-22B-**-11	IH03J-100060	1	TH-10x50	4	WS-B-10	4	NBR-90 G30	1
IHF-23-T-20	23	IH03J-100080	1	"	4	"	4	NBR-90 G35	1
IHF-24-T-20	24	IH03J-100120	1	TH-12x55	4	WS-B-12	4	NBR-90 G50	1
IHF-25-T-20	25	IH03J-100160	1	TH-12x60	4	"	4	NBR-90 G60	1
IHF-26-T-20	26	IH03J-100200	1	TH-12x65	4	"	4	NBR-90 G75	1
IHF-33-T-20	IPH-33B-**-11	IH03J-100100	1	TH-10x55	4	WS-B-10	4	NBR-90 G40	1
IHF-34-T-20	34	IH03J-100120	1	TH-12x55	4	WS-B-12	4	NBR-90 G50	1
IHF-35-T-20	35	IH03J-100160	1	TH-12x60	4	"	4	NBR-90 G60	1
IHF-36-T-20	36	IH03J-100200	1	TH-12x60	4	"	4	NBR-90 G75	1
IHF-44-T-20	IPH-44B-**-11	IH03J-100120	1	TH-12x55	4	"	4	NBR-90 G50	1
IHF-45-T-20	45	IH03J-100200	1	TH-12x65	4	"	4	NBR-90 G75	1
IHF-46-T-20	46	IH03J-100240	1	TH-16x75	4	WS-B-16	4	NBR-90 G85	1

OUT Flange (Shaft Side)							OUT Flange (Head Side)							Plug			
Flange Part No.		Bolt		Washer		O-ring		Flange Part No.		Bolt		Washer			O-ring		
IH03J-100040	1	TH- 8x45	4	WS-B- 8	4	NBR-90 P22	1	IH03J-100040	1	TH- 8x45	4	WS-B- 8	4	NBR-90 P22	1	TPHA-1/4	3
IH03J-100040	1	"	4	"	4	NBR-90 P22	1	"	1	"	4	"	4	"	1	"	3
IH03J-100060	1	TH-10x50	4	WS-B-10	4	NBR-90 G30	1	"	1	"	4	"	4	"	1	"	3
IH03J-100080	1	"	4	"	4	NBR-90 G35	1	"	1	"	4	"	4	"	1	"	2
IH03J-100120	1	TH-12x60	4	WS-B-12	4	NBR-90 G50	1	"	1	"	4	"	4	"	1	"	2
IH03J-100040	1	TH- 8x45	4	WS-B- 8	4	NBR-90 P22	1	IH03J-100040	1	TH- 8x45	4	WS-B- 8	4	NBR-90 P22	1	"	2
IH03J-100060	1	TH-10x50	4	WS-B-10	4	NBR-90 G30	1	"	1	"	4	"	4	"	1	"	3
IH03J-100080	1	"	4	"	4	NBR-90 G35	1	"	1	"	4	"	4	"	1	"	2
IH03J-100120	1	TH-12x60	4	WS-B-12	4	NBR-90 G50	1	"	1	"	4	"	4	"	1	"	2
IH03J-100060	1	TH-10x50	4	WS-B-10	4	NBR-90 G30	1	IH03J-100060	1	TH-10x50	4	WS-B-10	4	NBR-90 G30	1	"	3
IH03J-100080	1	"	4	"	4	NBR-90 G35	1	"	1	"	4	"	4	"	1	"	2
IH03J-100120	1	TH-12x60	4	WS-B-12	4	NBR-90 G50	1	"	1	"	4	"	4	"	1	"	2

Pipe Flange Installation Dimension Diagram



Screw in type

Pipe Flange Kit Part Number	SAE Standard	Nominal Diameter X"	Dimensions (mm)							Weight kg
			A	B	C	D	T	ϕd_1	ϕd_4	
IH03J-100040	SAE J518b 1/2	1/2	54	46	38.1	17.5	33	9	12.7	0.4
-100060	SAE J518b 3/4	3/4	65	52	47.5	22.0	33	11	20	0.6
-100080	SAE J518b 1	1	70	59	52.4	26.2	33	11	27	0.6
☆ -100100	SAE J518b 1 1/4	1 1/4	79	73	58.7	30.2	38	11	33	1.0
-100120	SAE J518b 1 1/2	1 1/2	94	83	70.0	36.0	38	13	37.5	1.4
☆ -100160	SAE J518b 2	2	102	97	77.8	42.9	38	13	50	1.7
☆ -100200	SAE J518b 2 1/2	2 1/2	114	109	88.9	50.8	43	13	60	2.1
☆ -100240	SAE J518b 3	3	135	131	106.4	61.9	48	17.5	71	3.3

Welded Type

Pipe Flange Kit Part Number	SAE Standard	Pipe Diameter	Dimensions (mm)										Weight kg
			A	B	C	D	T	e	ϕd_1	ϕd_2	ϕd_3	ϕd_4	
IH03J-200040	SAE J518b 1/2	1/2	54	46	38.1	17.5	33	11	9	22.2	27	12.7	0.4
-200060	SAE J518b 3/4	3/4	65	52	47.5	22.0	33	12	11	27.7	35	20	0.6
-200080	SAE J518b 1	1	70	59	52.4	26.2	33	14	11	34.5	42	27	0.6
☆ -200100	SAE J518b 1 1/4	1 1/4	79	73	58.7	30.2	38	16	11	43.2	48	33	1.0
-200120	SAE J518b 1 1/2	1 1/2	94	83	70.0	36.0	38	18	13	49.1	58	37.5	1.4
☆ -200160	SAE J518b 2	2	102	97	77.8	42.9	38	19	13	61.1	68	50	1.7
☆ -200200	SAE J518b 2 1/2	2 1/2	114	109	88.9	50.8	43	22	13	77.1	82	60	2.1
☆ -200240	SAE J518b 3	3	135	131	106.4	61.9	48	25	17.5	90.0	97	71	3.3

Recommended Tightening Torque for Flange Installation Bolts

For aluminum body

Mounting bolt	Tightening Torque N · m (kgf · cm)
M8	19.6 to 23.5 {200 to 240}
M10	49.0 to 58.8 {500 to 600}
M12	88.2 to 112.7 {900 to 1150}

For cast body (shared IN port)

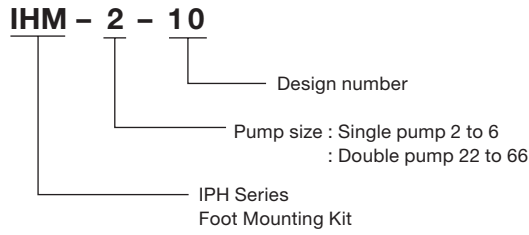
Mounting bolt	Tightening Torque N · m (kgf · cm)
M10	50 to 65 { 510 to 662}
M12	88 to 112 { 898 to 1140}
M16	215 to 275 {2192 to 2800}

Note 1) There is no RC (previously PT) 1/4 tap for the above flange numbers (exclusively for suction port use) marked with a star (☆).

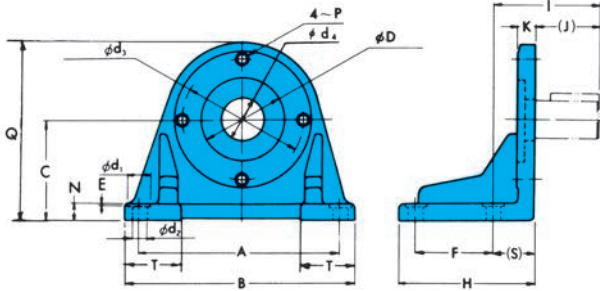
Note 2) The bolt's thread length should be more than 1.25 times the bolt's diameter and the bolt must not reach the bottom of the bolt hole.

IPH Series Foot Mounting Kit

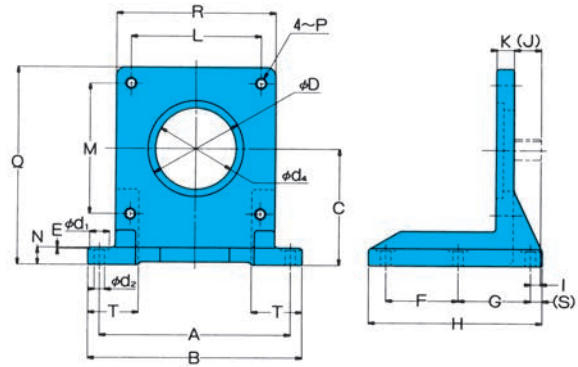
Understanding Foot Mounting Kit Numbers:
 When only the mounting feet are required for a single pump or double pump, pump mounting bolts, washers and other parts are sold together as the Foot Mounting Kit.



Foot Mounting Installation Measurement Chart
 SAE-2BOLT-MOUNTING



SAE-4BOLT-MOUNTING



SAE-2BOLT-MOUNTING

Foot Mounting Kit Model No.	Applicable Pump Model No.		Accessories				Dimensions (mm)					
	SINGLE PUMP	DOUBLE PUMP	Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F	H
IHM-2-10	IPH-2	-	TB-10x30	2	WP-10	2	127	152.5	69.8	1	50.8	96
IHM-4-10	IPH-3	-	TB-12x30	2	WG-12	2	220.7	246	107.95	1	114.3	140
IHM-4-10	IPH-4	-	TB-12x30	2	WG-12	2	220.7	246	107.95	1	114.3	140
IHM-22-10		IPH-22	TB-10x30	2	WP-10	2	171.45	204	107.95	1	95.25	150
IHM-44-10		IPH23, IPH-33	TB-12x30	2	WG-12	2	235	267	139.7	1	127	193
IHM-44-10		IPH-24, IPH-34, IPH-44	TB-12x30	2	WG-12	2	235	267	139.7	1	127	193
IHM-45-10	IPH-5	IPH-25, IPH-35, IPH-45	TB-16x40	2	WP-16	2	295.3	334	152.4	1	139.7	203
IHM-46-10	IPH-6	IPH-26, IPH-36, IPH-46	TB-20x50	2	WP-20	2	330.2	374	203.2	1	149.2	220.7

Foot Mounting Kit Model No.	Dimensions (mm)													Weight kg
	I	(J)	K	N	P	Q	(S)	T	phi D	phi d1	phi d2	phi d3	phi d4	
IHM-2-10	74	41.5	17.5	13	M10	135	32.5	36.5	82.55	22	11	106.4	50	2.0
IHM-4-10	61.7	49	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	5.5
IHM-4-10	74.7	62	16	16	M12	195.5	12.7	53	101.6	22	11	146	40	5.5
IHM-22-10	73.5	41	18	18	M10	180	32.5	50	82.55	22	11	106.4	40	6.5
IHM-44-10	89.5	45	20	20	M12	232	44.5	57.5	101.6	22	14	146	40	12.0
IHM-44-10	102.5	58	20	20	M12	232	44.5	57.5	101.6	22	14	146	40	12.0
IHM-45-10	104.5	60	25	25	M16	259	44.5	61	127	35	18	181	86	13.5
IHM-46-10	119.5	70	30	30	M20	337	49.5	64	152.4	37	20	228.6	100	22.0

SAE-4BOLT-MOUNTING

Foot Mounting Kit Model No.	Applicable Pump Model No.	Accessories				Dimensions (mm)								
		DOUBLE PUMP	Bolt	Q'ty	Washer	Q'ty	A	B	C	E	F	G	H	I
IHM-55-10	IPH-55		TH-20x50	4	WS-B-20	4	330	370	200	1	125	125	300	17
IHM-66-10	IPH56, IPH-66		TH-24x60	4	WS-B-24	4	380	430	260	1	140	140	340	17

Foot Mounting Kit Model No.	Dimensions (mm)														Weight kg
	(J)	K	L	M	N	P	Q	R	(S)	T	phi D	phi d1	phi d2	phi d4	
IHM-55-10	47	30	224.6	224.6	30	M20	340	275	20	90	165.1	34	18	140	32.0
IHM-66-10	52	40	247.5	247.5	40	M24	415	310	25	105	177.8	34	18	150	48.0

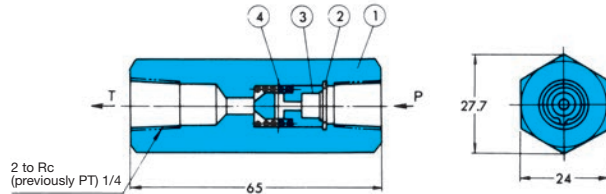
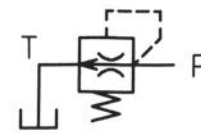
Air Bleed-off Valve

Equipping an air bleed-off valve on the pump's discharge side helps to simplify air bleeding during test operation.

Specifications

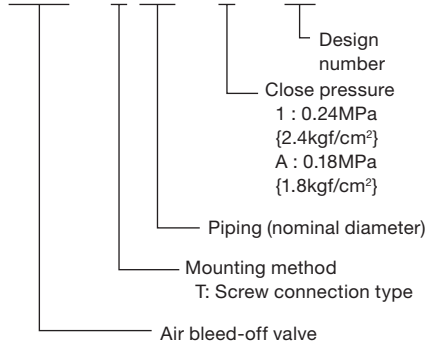
- ① Air inside the pump and the suction pipe is exhausted rapidly when the pump is started up. When discharge pressure reaches 0.2MPa {2.0kgf/cm²} or greater after the pump intakes oil, a valve closes to prevent oil from leaking.
- ② Maximum operating pressure: 30MPa {306kgf/cm²}
- ③ Provide piping to ensure that the tank port is under the oil level surface.

JIS symbol



Explanation of model No.

CAB - T 02 - 1 - 11



Part No.	Part Name	Q'ty
1	Valve body	1
2	Snap ring	1
3	Valve	1
4	Spring	1

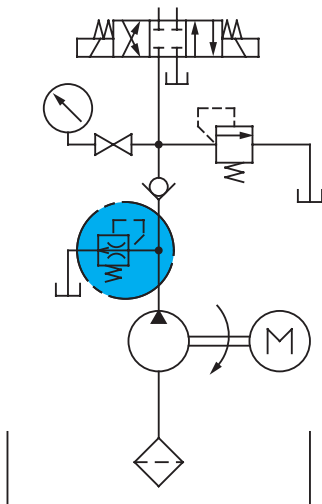
Note 1) If chattering occurs in a circuit when CAB-T02-1-11 is used, use CAB-T02-A-11 instead.

2) If chattering occurs in a circuit when CAB-T02-A-11 is used, use of a CAB air bleed-off valve is not required.

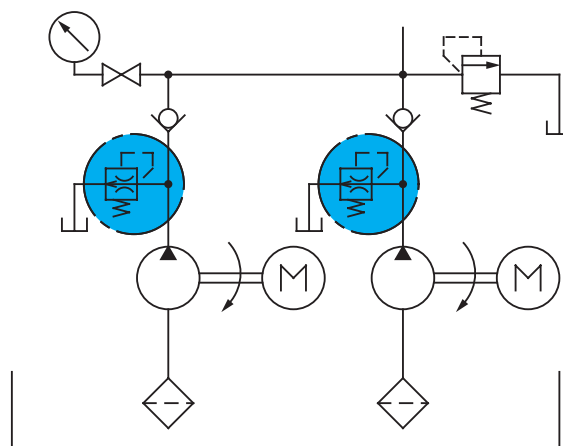
Application Examples

Example of Circuits that Require an Air Bleed-off Valve

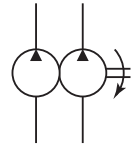
- ① When using a Type 2 or Type 3 check valve (Sample Circuit A)
- ② When unload circuit function cannot be achieved (Sample Circuit A)
- ③ When the discharge sides of multiple pumps run together (Sample Circuit B)



Circuit Diagram A



Circuit Diagram B



IPH Series Double IP Pump

3.6 to 125.9cm³/rev
30MPa

❖ All the types in this new design (11D) series are installation compatible with the previous design (10D). Note, however, that there is no longer compatibility for some of the seal components between the IPH-3 and IPH-4 sizes and the 3 and 4 sizes.

Features

① Configured with the high-pressure, low-noise IPH Series and IP pumps, these double pumps greatly expand

the range of application for the IP pump.

② A wide selection of pump combinations provides options that are perfect for just about any type of application imaginable.

Specifications

Model No.	Discharge Rate (1200min ⁻¹ No-load)		Revolution Speed		Operating Pressure MPa(kgf/cm ²)	Required Power at 1200min ⁻¹ , 21MPa kW
	Vent Side ℓ/min	Shaft Side ℓ/min	Min. min ⁻¹	Max. min ⁻¹		
IPH-22B-*-(*)-11	4.3 to 9.8	4.3 to 9.8	600	2000	Rated: 21 {214} Max: 30 {306}	7.99
IPH-23B		12.2 to 18.9				11.6
IPH-24B		24.8 to 38.7				19.5
IPH-25B		48.9 to 76.6				34.5
IPH-26B	97.5 to 151.0	64.0				
IPH-33B	12.2 to 18.9	12.2 to 18.9	500	2000		15.3
IPH-34B		24.8 to 38.7				23.1
IPH-35B		48.9 to 76.6				38.1
IPH-36B		97.5 to 151.0				67.7
IPH-44B	24.8 to 38.7	24.8 to 38.7	400	2000		31.0
IPH-45B		48.9 to 76.6			46.0	
IPH-46B		97.5 to 151.0			75.6	
IPH-55B		48.9 to 76.6			61.0	
IPH-56B	48.9 to 76.6	97.5 to 151.0	300	2000	90.6	
IPH-66B		97.5 to 151.0			119.3	

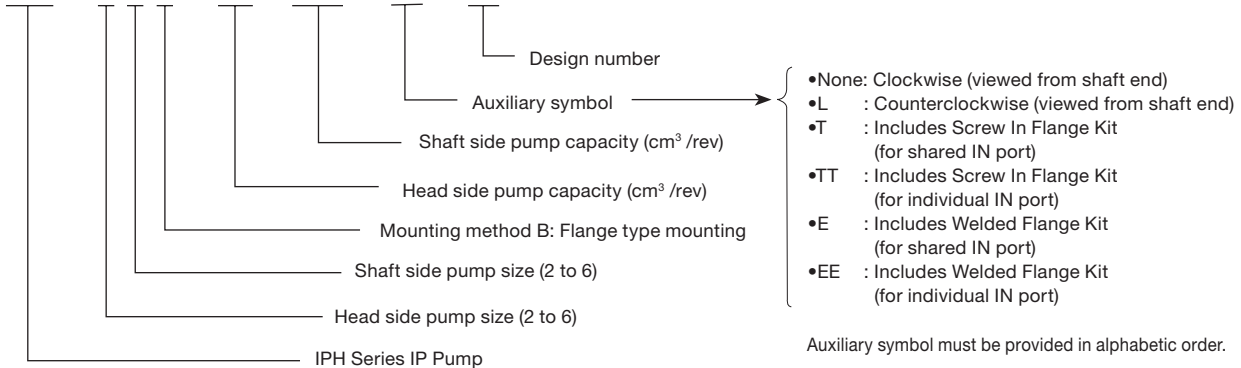
- Note) 1. Maximum Pressure: Maximum pressure limit when there are frequent pressure changes. However, maximum pressure is the same as rated pressure when load is applied to the head side and shaft side simultaneously.
 2. Suction Pressure: -0.02 to +0.03 MPa {-0.2 to +0.3 kgf/cm²}
 3. Avoid installation with the suction port towards the bottom of the pump. If the revolution speed will exceed 1800mm⁻¹, provide separate piping for shaft side and head size IN ports.
 4. Specify using the model number format shown below when pipe flange is required.
 5. Working pressure is continuous operating pressure when the same pressure exists on the head side and shaft side.
 6. Individual pump performance on the head side and shaft side is the same as that of the single pumps. Required power is the sum of the power required by each of the two pumps.
 7. The "Required Power at 1200min⁻¹, 21MPa (kW)" column in the above table are based on combinations that provide the maximum capacity for each model number, when pressure at both the head side and shaft side is 21MPa. Examples of combinations that provide "the maximum capacity for each model number" are IPH-22B-8-8-11 for IPH-22B, and IPH-46B-32-125-11 for IPH-46B. A capacity of 125 for all *6B Type 6 pumps is used for calculations.

● Handling

Handling is in accordance with procedures for the IPH pump. See page C-1 for more information.

Explanation of model No.

IPH - 4 6 B - 20 - 125 - LT - 11

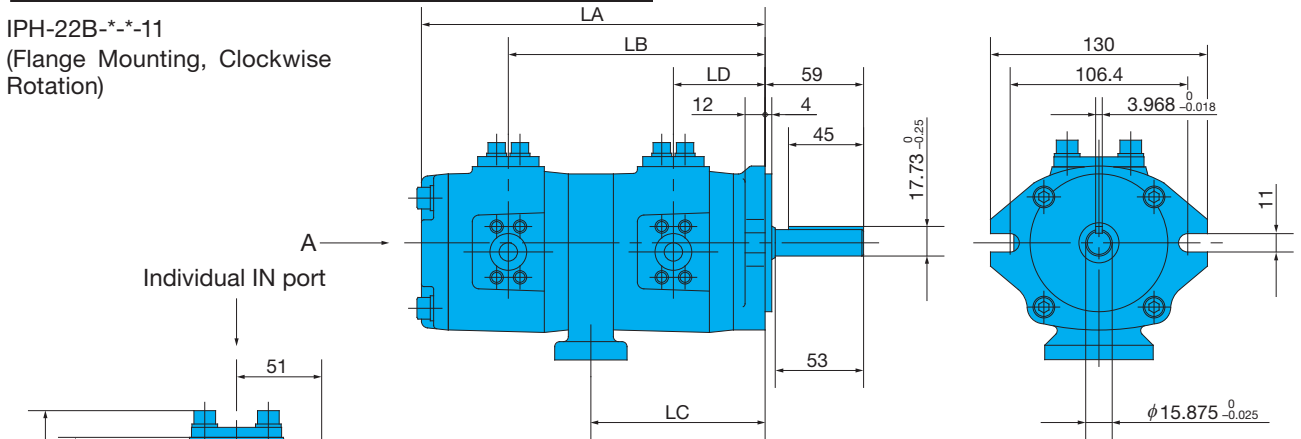


● IPH Series Double IP Pump Foot Mounting Kit
See the IPH Series (single) IP pump section in page C-12.

● IPH Series Double IP Pump Pipe Flange
See the IPH Series (single) IP pump section in page C-10.

Installation Dimension Drawings

IPH-22B-*-11
(Flange Mounting, Clockwise Rotation)

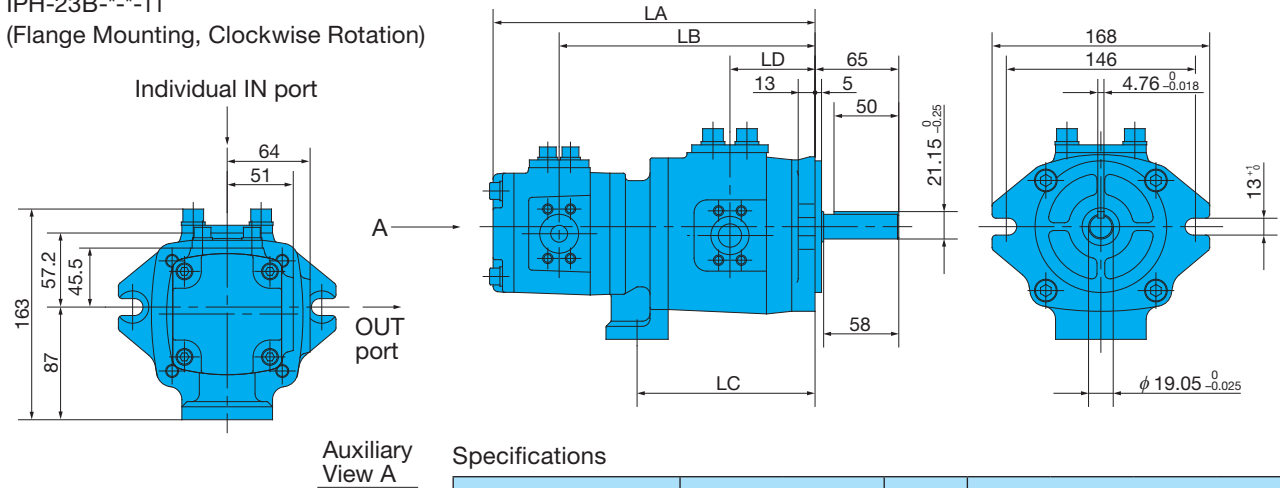


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-22B-3.5-3.5-11	3.60	3.60	5.8	211.5	160	105.5	51
-5		5.24	5.9	216.5	165	110.5	53.5
-6.5		6.55	6.0	220.5	169	114.5	55
-8		8.18	6.2	225.5	174	119.5	58
IPH-22B-5 -5 -11	5.24	5.24	6.0	221.5	167.5	110.5	53.5
-6.5		6.55	6.1	225.5	171.5	114.5	55
-8		8.18	6.3	230.5	176.5	119.5	58
IPH-22B-6.5-6.5-11	6.55	6.55	6.2	229.5	173.5	114.5	55
-8		8.18	6.4	234.5	178.5	119.5	58
IPH-22B-8 -8 -11	8.18	8.18	6.6	239.5	181	119.5	58

Note) Dimensions shown in this diagram are for a single pump.

IPH-23B-*-11
(Flange Mounting, Clockwise Rotation)



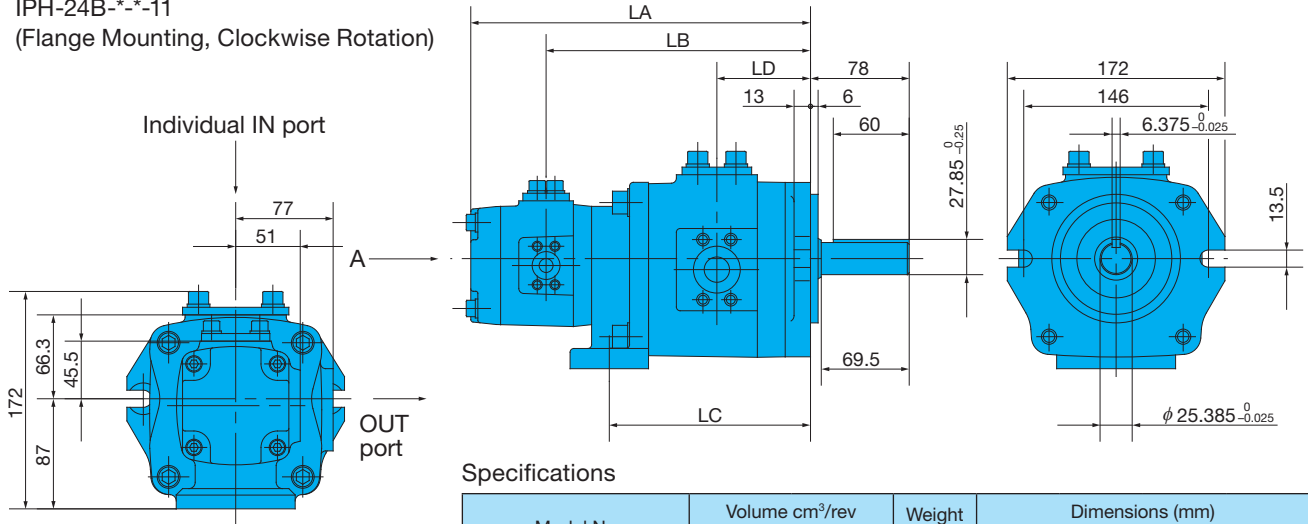
Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-23B-3.5-10-11	3.60	10.2	8.2	230.5	179	126	60
-13		13.3	8.4	236.5	185	132	63
-16		15.8	8.7	241.5	190	137	65.5
IPH-23B-5 -10-11	5.24	10.2	8.3	235.5	181.5	126	60
-13		13.3	8.5	241.5	187.5	132	63
-16		15.8	8.8	246.5	192.5	137	65.5
IPH-23B-6.5-10-11	6.55	10.2	8.4	239.5	183.5	126	60
-13		13.3	8.6	245.5	189.5	132	63
-16		15.8	8.9	250.5	194.5	137	65.5
IPH-23B-8 -10-11	8.18	10.2	8.6	244.5	186	126	60
-13		13.3	8.8	250.5	192	132	63
-16		15.8	9.1	255.5	197	137	65.5

Note) IPH-22B (23B)-*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.



IPH-24B--*-11**
(Flange Mounting, Clockwise Rotation)

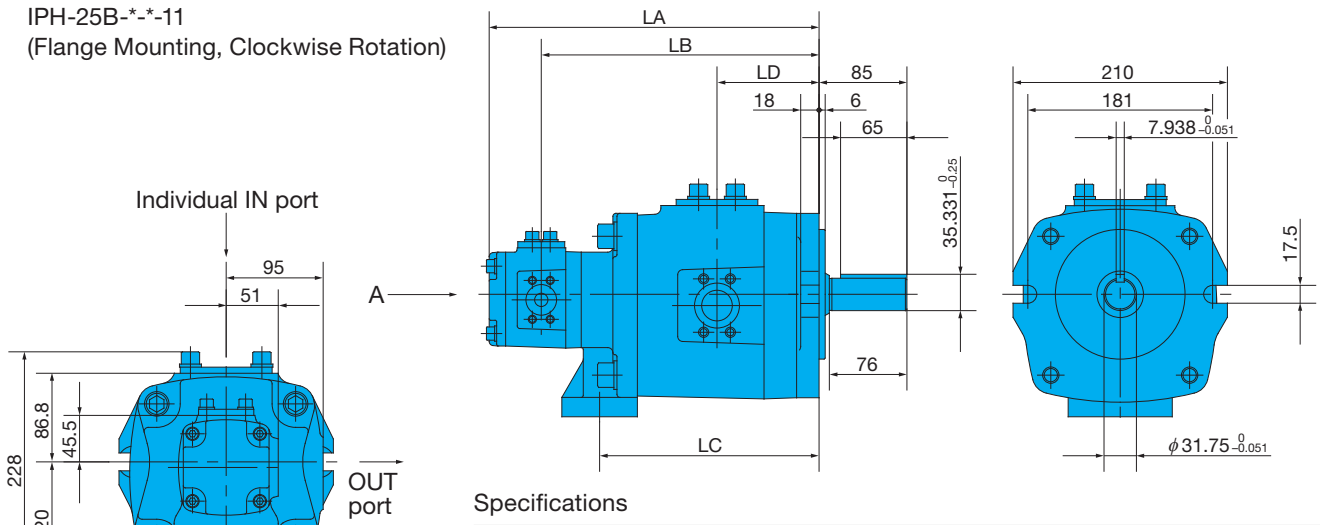


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-24B-3.5-20-11	3.60	20.7	12.8	250.5	199	153	71
		25.7	13.3	256.5	205	159	74
		32.3	13.8	264.5	213	167	78
IPH-24B-5 -20-11	5.24	20.7	12.9	255.5	201.5	153	71
		25.7	13.4	261.5	207.5	159	74
		32.3	13.9	269.5	215.5	167	78
IPH-24B-6.5-20-11	6.55	20.7	13.0	259.5	203.5	153	71
		25.7	13.5	265.5	209.5	159	74
		32.3	14.0	273.5	217.5	167	78
IPH-24B-8 -20-11	8.18	20.7	13.2	264.5	206	153	71
		25.7	13.7	270.5	212	159	74
		32.3	14.2	278.5	220	167	78

Note) Dimensions shown in this diagram are for a single pump.

IPH-25B--*-11**
(Flange Mounting, Clockwise Rotation)

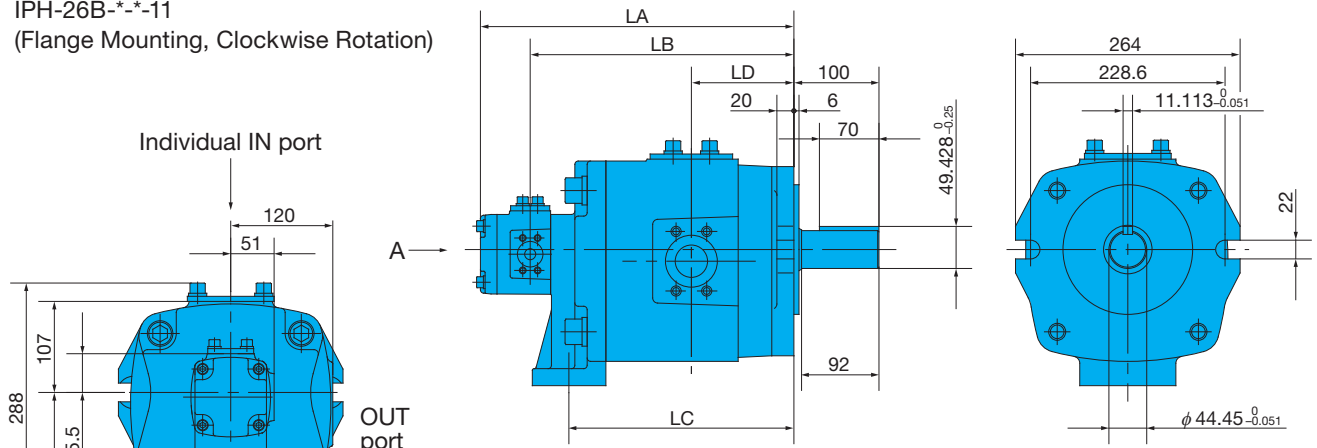


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-25B-3.5-40-11	3.60	40.8	24.1	298.5	247	197	91
		50.3	25.1	305.5	254	204	94.5
		63.9	26.1	315.5	264	214	99.5
IPH-25B-5 -40-11	5.24	40.8	24.2	303.5	249.5	197	91
		50.3	25.2	310.5	256.5	204	94.5
		63.9	26.2	320.5	266.5	214	99.5
IPH-25B-6.5-40-11	6.55	40.8	24.3	307.5	251.5	197	91
		50.3	25.3	314.5	258.5	204	94.5
		63.9	26.3	324.5	268.5	214	99.5
IPH-25B-8 -40-11	8.18	40.8	24.5	312.5	254	197	91
		50.3	25.5	319.5	261	204	94.5
		63.9	26.5	329.5	271	214	99.5

Note) IPH-24B (25B)-**-*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-26B-*-11
(Flange Mounting, Clockwise Rotation)

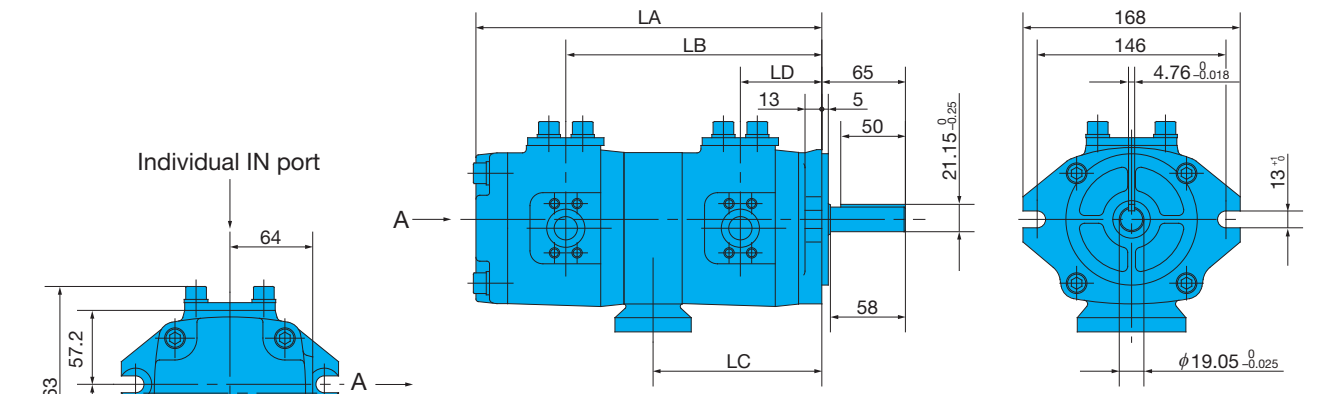


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-26B-3.5- 80-11	3.60	81.3	45.8	345.5	294	240	111.5
		101.6	47.8	355.5	304	250	116.5
		125.9	49.8	367.5	316	262	122.5
IPH-26B-5 - 80-11	5.24	81.3	45.9	350.5	296.5	240	111.5
		101.6	47.9	360.5	306.5	250	116.5
		125.9	49.9	372.5	318.5	262	122.5
IPH-26B-6.5- 80-11	6.55	81.3	46.0	354.5	298.5	240	111.5
		101.6	48.0	364.5	308.5	250	116.5
		125.9	50.0	376.5	320.5	262	122.5
IPH-26B-8 - 80-11	8.18	81.3	46.2	357	301	240	111.5
		101.6	48.2	367	311	250	116.5
		125.9	50.2	379	323	262	122.5

Note) Dimensions shown in this diagram are for a single pump.

IPH-33B-*-11
(Flange Mounting, Clockwise Rotation)

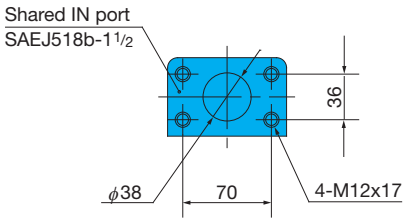
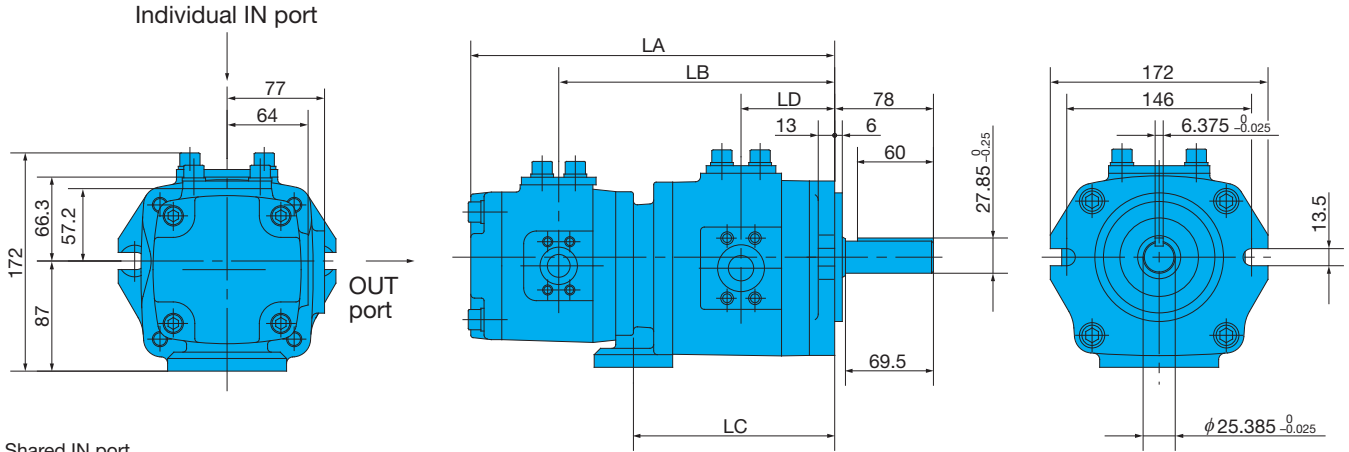


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-33B-10-10-11	10.2	10.2	10.3	255.5	189	124.5	60
		13.3	10.5	261.5	195	130.5	63
		15.8	10.8	266.5	200	135.5	65.5
IPH-33B-13-13-11	13.3	13.3	10.5	267.5	198	130.5	63
		15.8	11.0	272.5	203	135.5	65.5
IPH-33B-16-16-11	15.8	15.8	11.3	277.5	205.5	135.5	65.5

Note) IPH-26B (33B)-*-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-34B-**-11
(Flange Mounting, Clockwise Rotation)

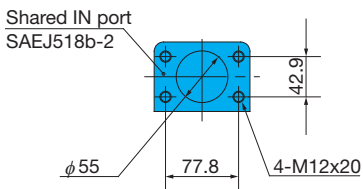
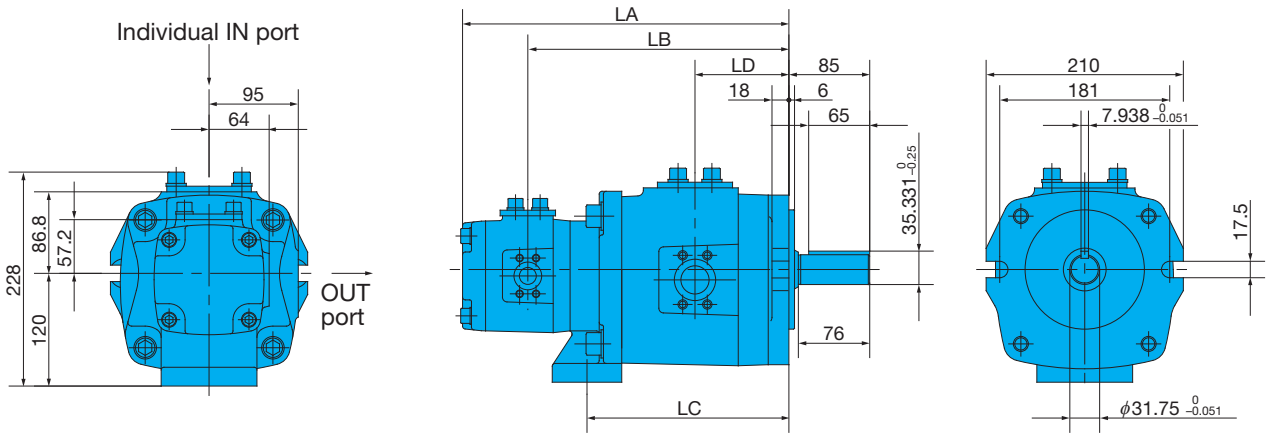


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-34B-10-20-11	10.2	20.7	14.9	272	209	153	71
-25		25.7	15.4	278	215	159	74
-32		32.3	15.9	286	223	167	78
IPH-34B-13-20-11	13.3	20.7	15.1	278	212	153	71
-25		25.7	15.6	284	218	159	74
-32		32.3	16.1	292	226	167	78
IPH-34B-16-20-11	15.8	20.7	15.4	283	214.5	153	71
-25		25.7	15.9	289	220.5	159	74
-32		32.3	16.4	297	228.5	167	78

Note) Dimensions shown in this diagram are for a single pump.

IPH-35B-**-11
(Flange Mounting, Clockwise Rotation)

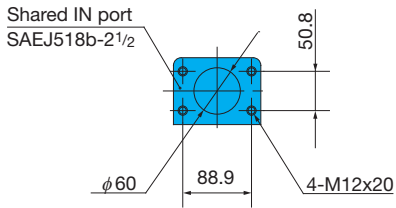
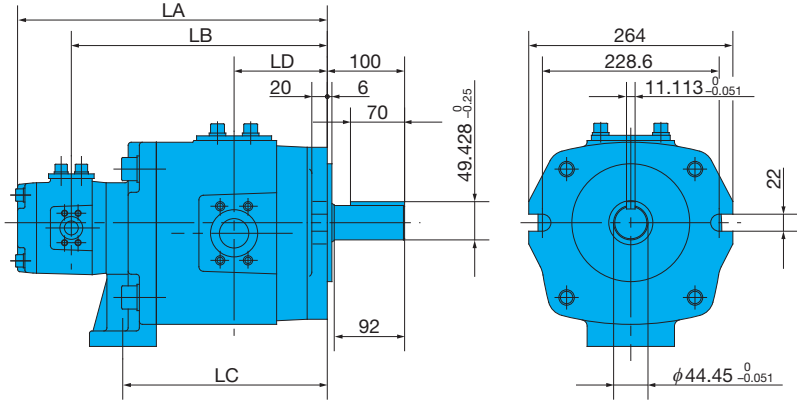
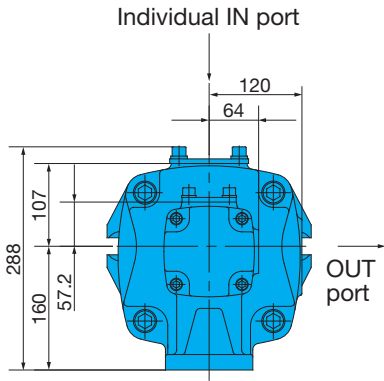


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-35B-10-40-11	10.2	40.8	26.4	323.5	257	197	91
-50		50.3	27.4	330.5	264	204	94.5
-64		63.9	28.4	340.5	274	214	99.5
IPH-35B-13-40-11	13.3	40.8	26.6	329.5	260	197	91
-50		50.3	27.6	336.5	267	204	94.5
-64		63.9	28.6	346.5	277	214	99.5
IPH-35B-16-40-11	15.8	40.8	26.9	334.5	262.5	197	91
-50		50.3	27.9	341.5	269.5	204	94.5
-64		63.9	28.9	351.5	279.5	214	99.5

Note) IPH-34B (35B)-**-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-36B-*-*-11
(Flange Mounting, Clockwise Rotation)

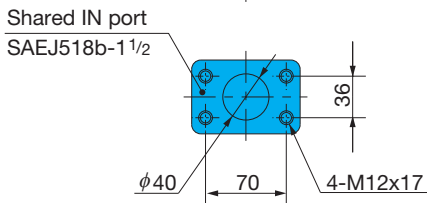
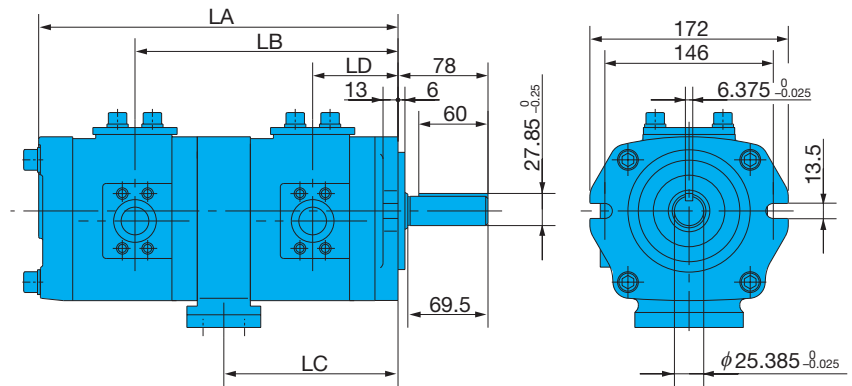
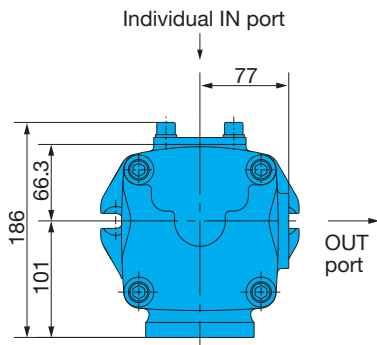


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)				
	Vent Side	Shaft Side		LA	LB	LC	LD	
IPH-36B-10- 80-11	10.2	81.3	47.8	370.5	304	240	111.5	
		-100	101.6	49.8	380.5	314	250	116.5
		-125	125.9	51.8	392.5	326	262	122.5
IPH-36B-13- 80-11	13.3	81.3	48.0	376.5	307	240	111.5	
		-100	101.6	50.0	386.5	317	250	116.5
		-125	125.9	52.0	398.5	329	262	122.5
IPH-36B-16- 80-11	15.8	81.3	48.3	381.5	309.5	240	111.5	
		-100	101.6	50.3	391.5	319.5	250	116.5
		-125	125.9	52.3	403.5	331.5	262	122.5

Note) Dimensions shown in this diagram are for a single pump.

IPH-44B-*-*-11
(Flange Mounting, Clockwise Rotation)



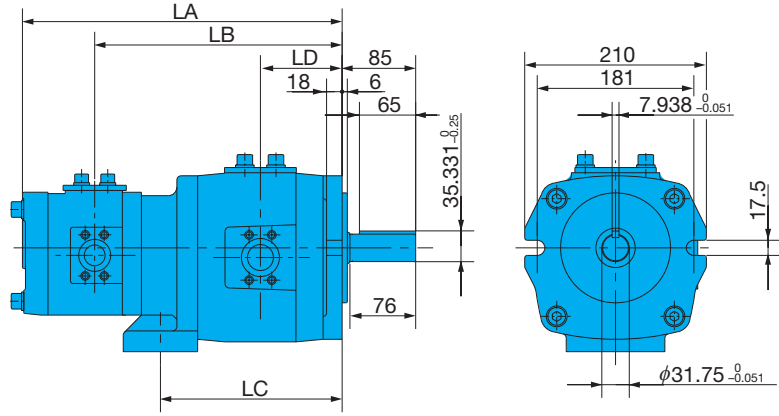
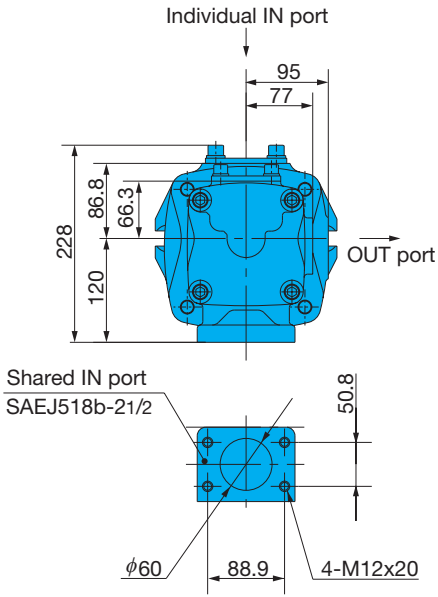
Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)				
	Vent Side	Shaft Side		LA	LB	LC	LD	
IPH-44B-20-20-11	20.7	20.7	19.5	307	219	145	71	
		-25	25.7	20.0	313	225	151	74
		-32	32.3	20.5	321	233	159	78
IPH-44B-25-25-11	25.7	25.7	20.5	319	228	151	74	
		-32	32.3	21.0	327	236	159	78
IPH-44B-32-32-11	32.3	32.3	21.5	335	240	159	78	

Note) IPH-36B (44B)-*-*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.



IPH-45B--*-11**
(Flange Mounting, Clockwise Rotation)

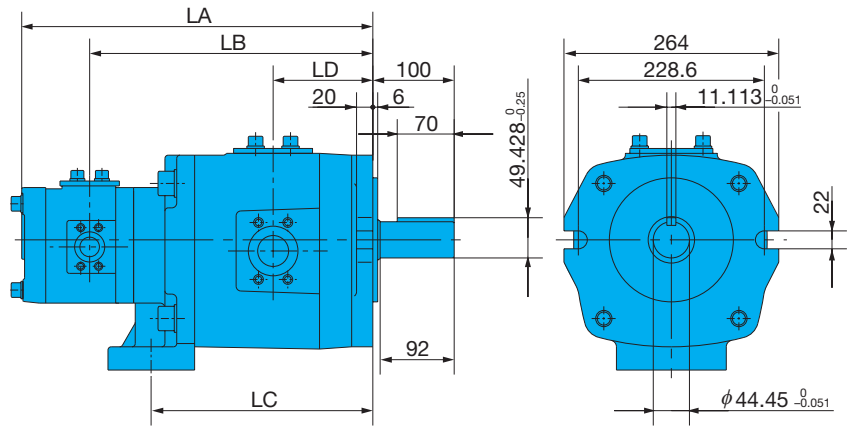
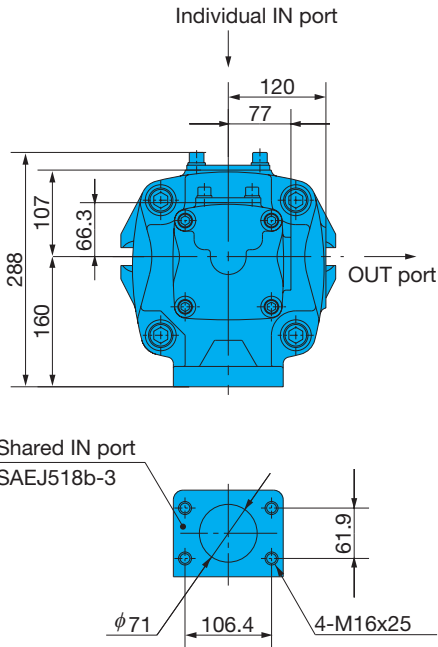


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-45B-20-40-11	20.7	40.8	30.1	357	276	203	91
-50		50.3	31.1	364	283	210	94.5
-64		63.9	32.1	374	293	220	99.5
IPH-45B-25-40-11	25.7	40.8	30.6	363	279	203	91
-50		50.3	31.6	370	286	210	94.5
-64		63.9	32.6	380	296	220	99.5
IPH-45B-32-40-11	32.3	40.8	31.1	371	283	203	91
-50		50.3	32.1	378	290	210	94.5
-64		63.9	33.1	388	300	220	99.5

Note) Dimensions shown in this diagram are for a single pump.

IPH-46B--*-11**
(Flange Mounting, Clockwise Rotation)

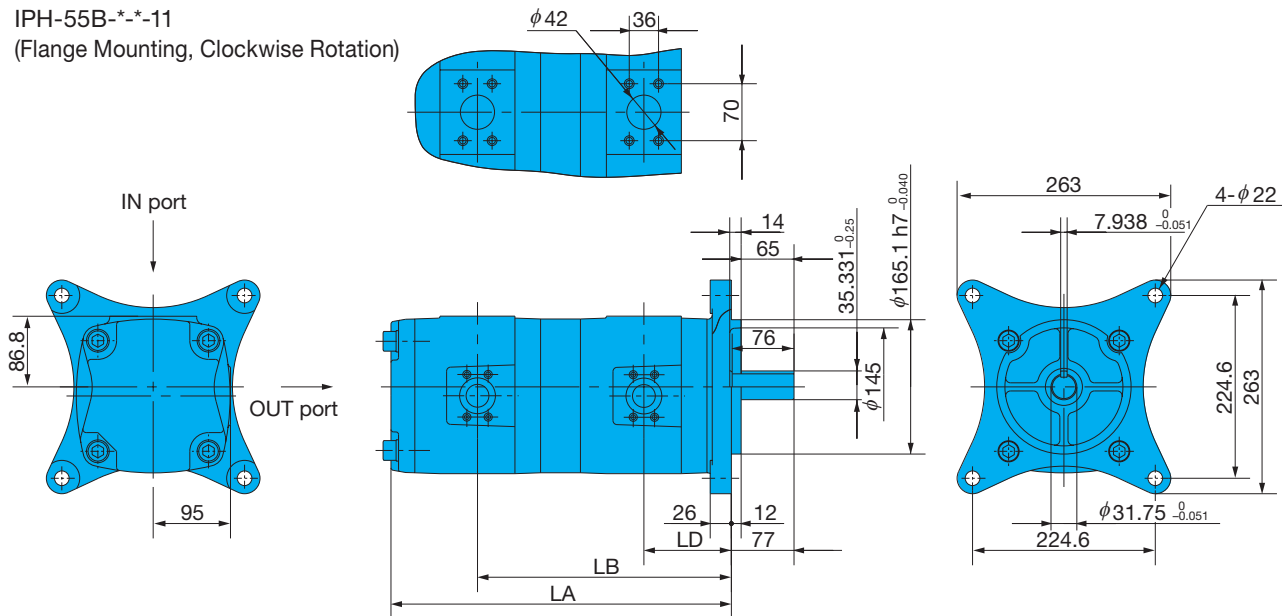


Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-46B-20- 80-11	20.7	81.3	52.1	404	323	250	111.5
-100		101.6	54.1	414	333	260	116.5
-125		125.9	56.1	426	345	272	122.5
IPH-46B-25- 80-11	25.7	81.3	52.6	410	326	250	111.5
-100		101.6	54.6	420	336	260	116.5
-125		125.9	56.6	432	348	272	122.5
IPH-46B-32- 80-11	32.3	81.3	53.1	418	330	250	111.5
-100		101.6	55.1	428	340	260	116.5
-125		125.9	57.1	440	352	272	122.5

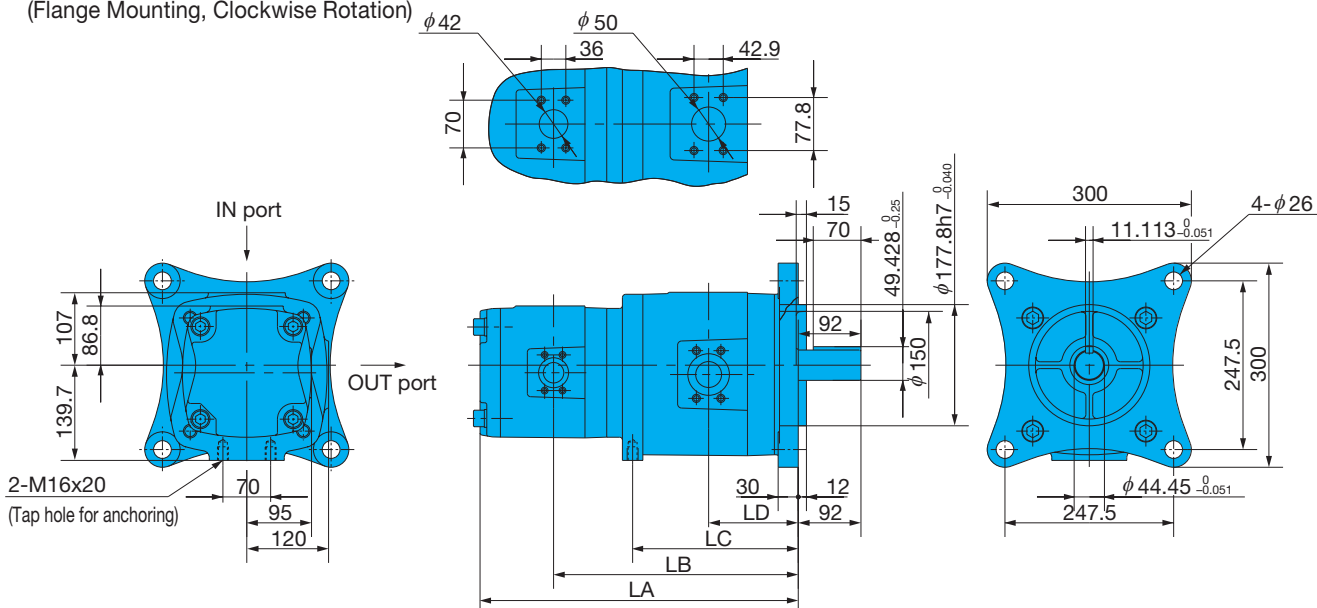
Note) Dimensions shown in this diagram are for a single pump.

Note) IPH-45B (46B)-**-*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-55B-*-*-11
 (Flange Mounting, Clockwise Rotation)

Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)		
	Vent Side	Shaft Side		LA	LB	LD
IPH-55B-40-40-11	40.8	40.8	45.5	385	286	99
-50		50.3	46.5	392	293	102.5
-64		63.9	47.5	402	303	107.5
IPH-55B-50-50-11	50.3	50.3	47.5	399	296.5	102.5
-64		63.9	48.5	409	306.5	107.5
IPH-55B-64-64-11	63.9	63.9	49.5	419	311.5	107.5

Note) Dimensions shown in this diagram are for a single pump.

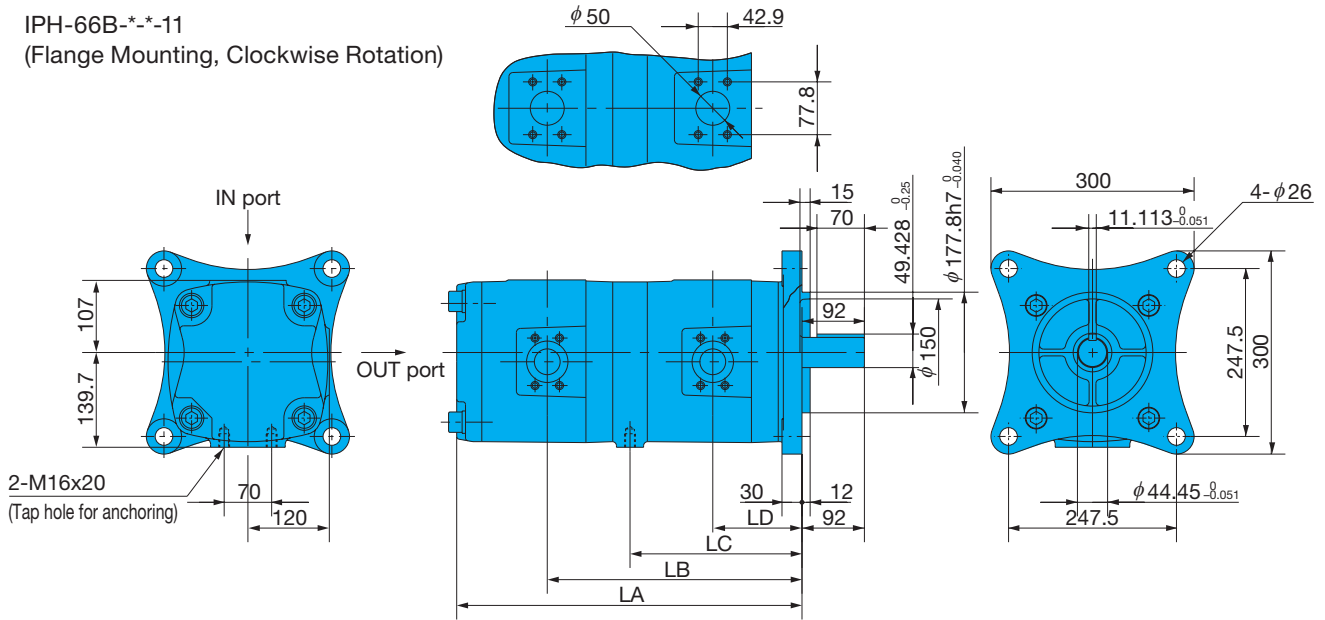
IPH-56B-*-*-11
 (Flange Mounting, Clockwise Rotation)

Specifications

Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-56B-40- 80-11	40.8	81.3	70.6	427	328	221	120.5
-100		101.6	72.6	437	338	231	125.5
-125		125.9	74.6	449	350	243	131.5
IPH-56B-50- 80-11	50.3	81.3	71.6	434	331.5	221	120.5
-100		101.6	73.6	444	341.5	231	125.5
-125		125.9	75.6	456	353.5	243	131.5
IPH-56B-64- 80-11	63.9	81.3	72.6	444	336.5	221	120.5
-100		101.6	74.6	454	346.5	231	125.5
-125		125.9	76.6	466	358.5	243	131.5

Note) Dimensions shown in this diagram are for a single pump.

Note) IPH-55B (56B)-*-*-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the individual IN port is facing upwards, the discharge port flange is positioned to the right when viewed from the shaft side.

IPH-66B-**-*-11
(Flange Mounting, Clockwise Rotation)



Specifications

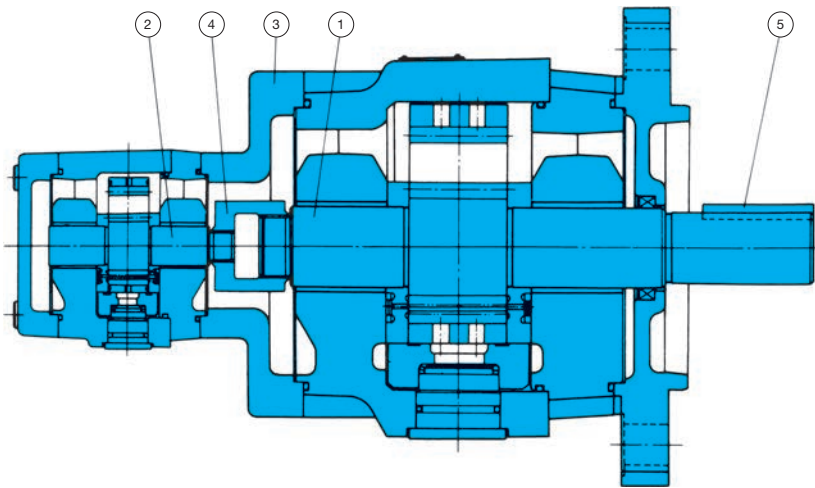
Model No	Volume cm ³ /rev		Weight kg	Dimensions (mm)			
	Vent Side	Shaft Side		LA	LB	LC	LD
IPH-66B- 80- 80-11	81.3	81.3	89.1	470	347.5	234	120.5
-100		101.6	91.1	480	357.5	244	125.5
-125		125.9	93.1	492	369.5	256	131.5
IPH-66B-100-100-11	101.6	101.6	93.1	490	362.5	244	125.5
-125		125.9	95.1	502	374.5	256	131.5
IPH-66B-125-125-11	125.9	125.9	97.1	514	380.5	256	131.5

Note) Dimensions shown in this diagram are for a single pump.

Note) IPH-66B-**-L-11 (foot mounting/flange mounting, counterclockwise rotation) are the mirror image of the drawings shown above. In the case the suction port flange is facing upwards, the discharge port flange position is to the right when viewed from the shaft side.

Cross-sectional Drawing

IPH Series Double IP Pump



Part No.	Part Name
1	Pinion shaft -1
2	Pinion shaft -2
3	Body -3
4	Joint
5	Key

Note) In the case of a double pump, use single pump parts in addition to the 5 parts listed above.

● **IPS Series Double IP Pump Seal Kit**
The double pump seal kit combines a shaft side pump seal kit with a head side pump seal kit. The shaft side pump seal kit (IHAS-2S****-**) is the same as the single pump seal kit. The head side pump seal kit (IHAS-

2H****-**) includes the same component parts as the single pump seal kit, except that it does not have a #23 oil seal. See the IPH Series (single) IP pump section in page C-9 for more information.

● **Air bleed-off valve**
See the IPH Series (single) IP pump section in page C-13.

NACHI Hydraulic Valves

Features

- ① Maximum operating pressure of 21 to 35MPa {214 to 357kgf/cm²} provides smooth operation at high pressures. Low leakage for high efficiency.
- ② Extremely stable performance across all pressure ranges.
- ③ Conformance with ISO recommended dimensions for most gasket installations enables a high degree of international compatibility.
- ④ A highly reliable and quiet wet type solenoid valve series is available when the noise and reliability issues of solenoid valves are a problem.
- ⑤ A comprehensive pipe-less series provides the ultimate in compact design and reliability.

Installation and Maintenance

- ① Installation is possible in horizontal, vertical, and diagonal configurations. However, the spool must be oriented horizontally in the case of a solenoid valve or hydraulic switching solenoid valve no-spring type.
- ② Precision finish the mounting surface to a surface roughness of 1.6a and degree of flatness of 0.01mm.

- ③ Make sure that the return piping from the hydraulic valve to the tank is below the fluid level surface.
- ④ Be sure to use only specified bolts on hydraulic valves. Use bolts of 12.9 strength classification or equivalent.
- ⑤ Installation bolts are not included with any modular valves, the SS, SA, SF, SNH, SL, SE, SED, and SAW G01 size solenoid valves, the DMA-G01 manual valve, or with sub plates. Bolts are included with gasket type valves other than those mentioned above.
- ⑥ Use O-rings with a hardness of Hs-90 for valve gasket O-rings.

Management of Hydraulic Operating Fluid

- ① Use mineral oil-based hydraulic operating fluid.
- ② See pages N-1 and N-2 for information about the viscosity of the operating fluid you need to use.
- ③ When using phosphate ester base operating fluid, include "P-" at the beginning of the model number. When using water- or glycol-based hydraulic operating fluid, refer to pages N-4 through N-6 for details on applicable models. Contact your

agent for information about other fire-resistant hydraulic fluids and special fluids.

- ④ Foreign matter in the hydraulic operating fluid can lead to frequent valve operation problems. Use a 25 μ m line filter to protect against contamination.

Terms Used in This Catalog

The following describes the meanings of the following terms used in this catalog:

- **Rated Flow Rate:**
Specific guaranteed flow rate under certain fixed conditions
- **Maximum Flow Rate:**
Maximum flow rate that satisfies valve function
- The following are the ratings that apply to the seal part list.
JIS standard B2401 (O-ring)
JIS standard B2407 (backup ring)
SAE standard AS568 (O-ring)
- Pipe apertures mentioned in this catalog that are indicated as "G*/**" comply with JIS B2351 O-ring seal systems.

Calculation of Hydraulic Valve Pressure Loss

Use the following formula to convert pressure loss values for each hydraulic valve in accordance with changes in operating fluid viscosity.

$$\Delta P_2 = \left(\frac{v_2}{v_1}\right)^{1/4} \cdot \Delta P_1$$

ΔP_1 : Pressure loss MPa {kgf/cm²} at for kinematic viscosity v_1

ΔP_2 : Pressure loss MPa {kgf/cm²} at for kinematic viscosity v_2

v_1 : Kinematic viscosity mm²/s

v_2 : Kinematic viscosity mm²/s

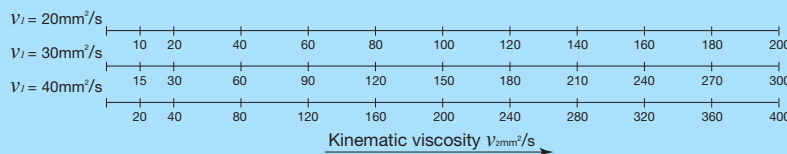
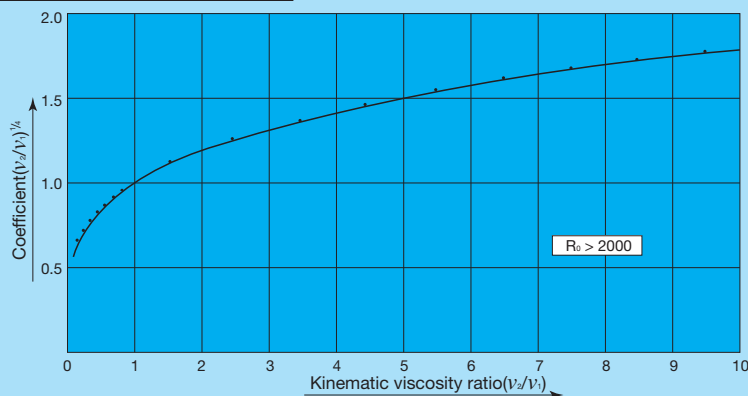
The graph on the right shows coefficient values $(v_2/v_1)^{1/4}$ kinematic viscosity ratios (v_1/v_2) .

<Example>

For a value whose pressure loss at the rated flow rate when $v_1 = 30$ mm²/s is $\Delta P_1 = 0.3$ MPa{3.1 kgf/cm²}, a change in viscosity to $v_2 = 90$ mm²/s produces a pressure loss of $(v_2/v_1) = 3$. According to the graph on the right, coefficient $(v_1/v_2)^{1/4} = 1.3$.

Accordingly :

$$\Delta P_2 = 1.3\Delta P_1 = 1.3 \times 0.3\text{MPa}\{3.1\text{kgf/cm}^2\} = 0.39\text{MPa}\{4.03\text{kgf/cm}^2\}$$



Factory Default Handle Setting

The following are the factory default pressure and flow rate settings for handles (screws) on adjustable valves.

- ① Pressure Control Valve: Near the minimum control pressure
- ② Flow Control Valve: Near the minimum control flow rate

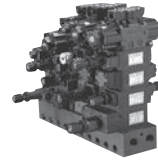
Note, however, that ER and ESR relief valves are set to rated pressures. For details, see the applicable pages for each type of valve.

Hydraulic Valve Selection Table

Pump Type	Name	Type Classification	Maximum Working Pressure MPa {kgf/cm ² }	Maximum Flow Rate ℓ/min											Page		
				1	2	5	10	20	50	100	200	500	1000	2000		5000	
Modular Valves	Relief modular valve	OR	25 {255}				01			03	04						D-13
	Brake modular valve	ORO	25 {255}		01				03								D-19
	Direct relief modular valve	ORD	25 {255}		01				03	04							D-23
	Pressure reducing modular valve	OG	25 {255}		01					03	04						D-28
	01 Size balance type Pressure reducing modular valve	OGB	25 {255}		01												D-35
	Reducing valve & modular valve	OG	25 {255}		01					03	04						D-37
	2-pressure reducing modular valve	OGS	25 {255}		01												D-44
	Sequence modular valve	OQ	25 {255}		01					03							D-47
	Counter balance modular valve	OCQ	25 {255}		01					03	04						D-50
	Pressure switching modular valve	OW	25 {255}		01												D-55
	Flow regulator modular valve	O(C)Y	25 {255}		01					03	04						D-58
	Flow control modular valve	O(C)F	25 {255}		01					03	04						D-66
	Check modular valve	OC(V)	25 {255}		01					03	04						D-72
	Pilot operated check modular valve	OCP	25 {255}		01					03	04						D-79
Solenoid Valves	SS wet type solenoid valve	SS	35 {357}				01				03					E-1	
	SA wet type solenoid valve	SA	35 {357}				01				03					E-13	
	SE lower power solenoid valve	SE	16 {163}				01				03					E-25	
	SED lower power solenoid valve	SED	16 {163}				01									E-32	
	SL wet type solenoid valve	SL	7 {71}				01									E-38	
	DSS(A) solenoid control valve	DSS DSA	35 {357}					04						06		E-45	
	Fine Solenoid Valve	SF	21 {214}				01									E-53	
	Non-leak Type Solenoid Valve	SNH	35 {357}				01			03	04	06				E-57	
	Directional control valve with monitoring switch	SAW	35 {357}				01									E-66	
Poppet type directional control valve with monitoring switch	SCW	21 {214}					03								E-75		
Pressure Control Valves	Relief valve	R	21 {214}						03		06	10				F-1	
	RI series relief valve	RI	35 {357}						03		06					F-5	
	Remote control valve	RC(D)	21 {214}	RC-02	RCD-02											F-8	
	Solenoid control relief valve	RSS(A)	21 {214}						03		06	10				F-10	
	RIS Series Solenoid control relief valve	RIS	35 {357}						03		06					F-15	
	Reducing (& check) valve	(C)G	21 {214}				03				06	10				F-18	

Note) Maximum operating pressure for the modular valve series is 35MPa {357kgf/cm²}.

Pump Type	Name	Type Classification	Maximum Working Pressure MPa {kgf/cm ² }	Maximum Flow Rate ℓ/min											Page			
				1	2	5	10	20	50	100	200	500	1000	2000		5000		
Pressure Control Valves	Balancing valve	GR	21 {214}			01				03							F-23	
	Pressure control (& check) valve	(C)Q	21 {214}			03					06	10					F-25	
Flow Control Valves	Throttle (& check) valve	(C)FR	21 {214}			03				06	10						G-1	
	FT type low control valve	(C)FT	21 {214}			02				03							G-4	
	F type control valve	(C)F	21 {214}					06					10				G-8	
	TN type flow control valve	(C)TN	10.5 {107}			02											G-11	
	TS type flow control valve	(C)TS	10.5 {107}			01											G-14	
	TL type flow control valve	TL(T)	7 {71}					03, 04										G-16
Direction Control Valves	Right angle check valve	CA	21 {214}			03				06	10						H-1	
	In-line check valve	CN	21 {214}			03				06	10						H-1	
	Pilot check valve	CP	21 {214}			03				06	10						H-4	
	Gauge cock	K ₂	42 {427}														H-7	
	DMA type manual valve	DMA	35 {357}			01				03							H-8	
Electro-hydraulic Proportional Control Valves	Pilot relief valve	EPR	35 {357}	01													I-2	
	Relief valve	ER	35 {357}				03				06						I-4	
	Relief and reducing valve	EGB	25 {255}			03				06							I-6	
	Flow control valve	(C)ES	21 {214}			02				03	06	10					I-8	
	Load response control valve	ESR	25 {255}				03				06	10					I-11	
	Flow direction control valve	ESD	25 {255}			01			03	04	06	10					I-14	
	Modular type reducing valve	EOG	25 {255}			01											I-22	
	Modular type flow control valve	EOF	21 {214}			01											I-24	
	Driver power amplifier	EMA EMC	-															I-26
	Driver power compact amplifier	EBA	-															I-30
	Compact multi-function power amplifier	EDA EDC	-															I-34
High-response Proportional Flow Control Valve	High-response proportional flow control valve	ESH	32 {327}			01				03	04	06					I-38	
	High-speed response proportional control valve amplifier	EHA	-														I-42	
Electro-hydraulic Servo Valves	NACHI-MOOG servo valve Driver servo amplifier	EA	-														I-44	
Other	Hydro-logic valve	HT, HF	28 {286}				06				10	16	24				J-1	



Modular Valve Series

20 to 300ℓ/min
21,25,35MPa

Overview

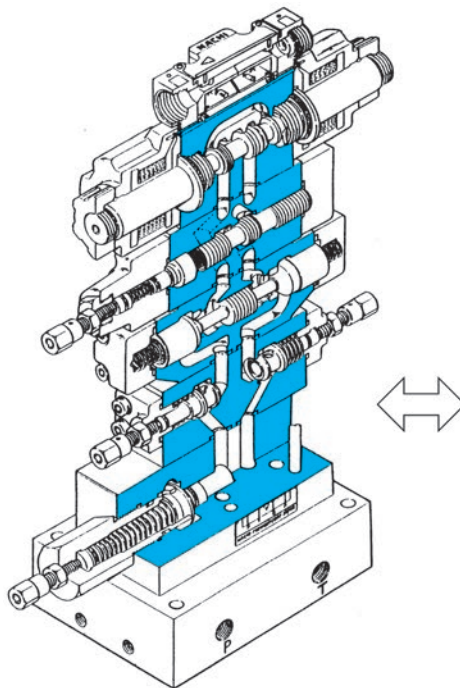
The modular valve is designed and engineered to integrate multiple hydraulic valve operations into a single unit, which eliminates the need for piping between valves and enables configuration

of a circuit using a single modular valve. The result is an innovative valve system whose energy and materials efficiency provide advantages in terms of compact configuration, reliability, and more.

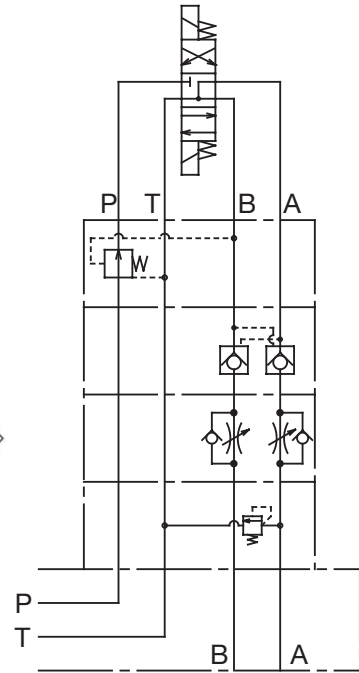
The illustrations below show one example of a circuit configuration using this system.

Features

- ① High pressure and high volume. Available maximum operating pressure operations are 21, 25, and 35MPa {214, 255, 357kgf/cm²}, while maximum control flow rates are G01 50ℓ/min, G03 100ℓ/min, G04 300ℓ/min.
- ② Ganging and bolting format allows for quick and easy circuit configuration as well as circuit changes and additions.
- ③ Compact module configurations greatly reduce space requirements.
- ④ Maintenance costs are also reduced because less piping and fewer couplings mean less need for acid rinsing and flushing of pipes.
- ⑤ Fewer fluid leak problems due to pipe resonance, noise, and loose couplings.
- ⑥ Circuit configuration is simple yet exact. Nameplates on the side of the valve show JIS codes that make it quick and easy to determine its performance.
- ⑦ A full lineup of models is available to meet a wide range of needs and circuit configurations: Model G01 58 Type 131, G03 52 Type 96, G04 30 Type 68.



Integrated Structural Diagram



Integrated Circuit Diagram

Specifications

Name	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Gasket Surface Dimensions	Possible Number of Ganged Valves (Note 2)
01 Series	1/8	25{255}(Note 1)	50	ISO 4401-03-02-0-05	1 to 4
03 Series	3/8	25{255}(Note 1)	100	ISO 4401-05-04-0-05	1 to 4
04 Series	1/2	35{357}	300	ISO 4401-07-06-0-05	1 to 3(Note 3)

- Note) 1. The M35 Series is available as a 35MPa {357kgf/cm²} maximum operating pressure version of the 01 and 03 Series. For details, see pages D-98 and D-99.
 2. The number of ganged valves does not include solenoid valves.
 3. Up to four valves can be ganged together if the maximum operating pressure is less than 21 MPa.

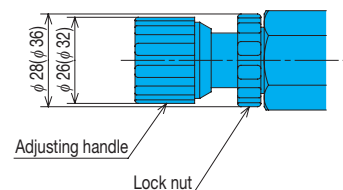
K Series Modular Valve

The valve shown in the photograph is available with nominal diameter 01 and 03 size adjusting bolts. Use the following format for specification.



Example: OCY-G01-W-Y-K-20

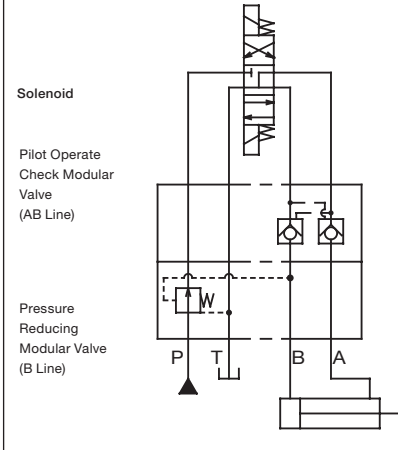
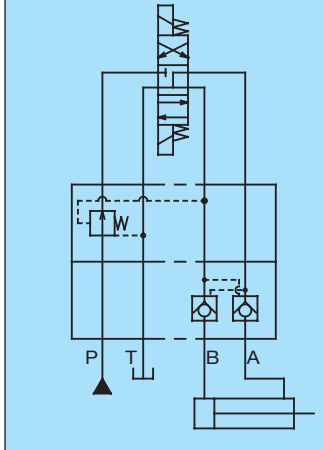
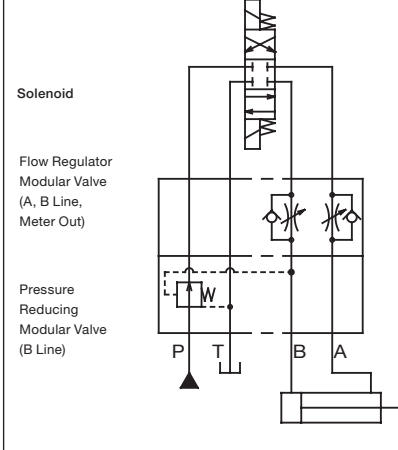
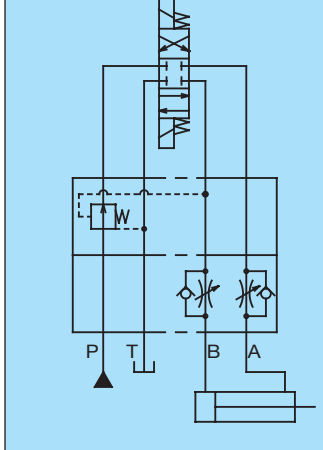
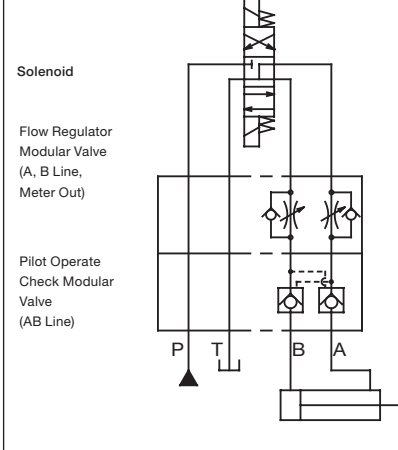
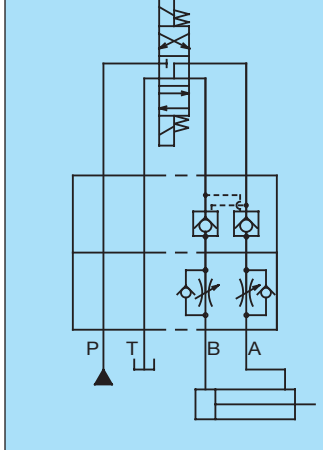
Auxiliary symbol
K: With handle



Dimensions in parentheses indicate nominal diameter 03.

Precautions when Ganging Modular Valves

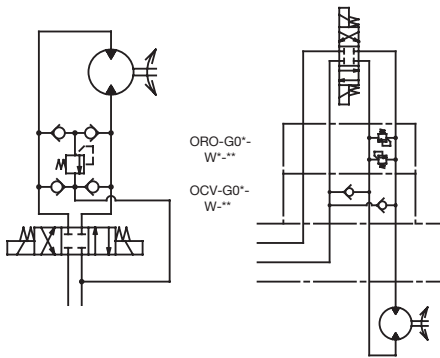
Note the following precautions when ganging modular valves together in the applicable example circuits.

Circuit Diagram	Description	Incorrect	Correct
<p>Locking Circuit and Pressure Reducing Circuit</p>	<ul style="list-style-type: none"> ● Cylinder position not maintained ○ Leaks occur because, during the pilot check, the line being maintained flows into the pilot line of the reducing valve. 	<p>Solenoid</p> <p>Pilot Operate Check Modular Valve (AB Line)</p> <p>Pressure Reducing Modular Valve (B Line)</p> 	
<p>Pressure Reduction Circuit with Speed Control</p>	<ul style="list-style-type: none"> ● Insufficient cylinder output and drop in speed ○ Pressure increases due to the restrictor effect of the flow regulator. Since the pilot runs from that line, pressure reduction makes smooth operation impossible. 	<p>Solenoid</p> <p>Flow Regulator Modular Valve (A, B Line, Meter Out)</p> <p>Pressure Reducing Modular Valve (B Line)</p> 	
<p>Locking Circuit and Speed Control Circuit</p>	<ul style="list-style-type: none"> ● Cylinder knocking ○ Pressure is increased by the restrictor effect of the flow regulator. That pressure moves the pilot check in the closed direction, which causes the valve to repeatedly open and close. 	<p>Solenoid</p> <p>Flow Regulator Modular Valve (A, B Line, Meter Out)</p> <p>Pilot Operate Check Modular Valve (AB Line)</p> 	

Valve Ganging Circuit Configuration Examples

Anti-cavitation Circuit

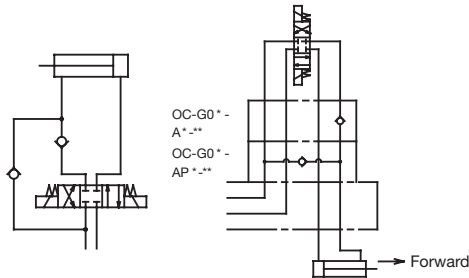
G⁰¹
G⁰³



- Surge pressure is prevented by the inertia of the actuator, and cavitation by fluid being sucked in through the opposite port, which is in negative pressure, is prevented.
- Example Valve Model Numbers (G03)
Relief Valve — ORO-G03-W*-J50
Vacuum Check Valve — OCV-G03-W-J50

Differential Circuit

G⁰¹
G⁰³



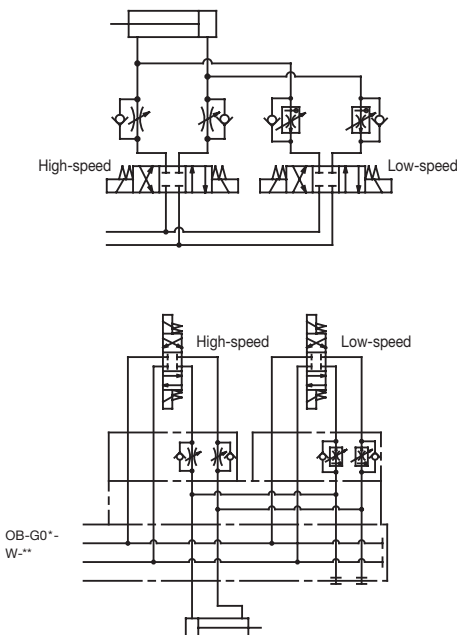
- When the cylinder advances, the rod side return fluid returns to the P port and the pump discharge rate and confluence are advanced at high speed (differential).
- Example Valve Model Numbers (G03)
Check valve — OC-G03-A*-J50
Differential check valve — OC-G03-AP*-J50

Important:

Cylinder effective output is the rod surface area portion only.

2-speed Circuit

G⁰¹
G⁰³



- This type of circuit allows variation between two actuator speeds. It prevents low-speed shock when the actuator starts up or stops, and it used when the intermediate stroke is operated at high speed.
- Example Valve Model Numbers (G03)
2-speed Plate — OB-G03-W-(H)-J30
High-speed Flow Regulator Valve — OCY-G-03-W-Y-J51
Low-speed Flow Control Valve — OCF-G03-W60-Y-J50

G01 Modular Valve Series

Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	JIS Symbol	Height mm	Weight kg	Catalog Page	
Solenoid Valves	Solenoid Valve	SS-G01-**-R**-31 SA-G01-**-***-31		100				E-1 E-13	
	Relief Valves (Balance Type)	OR-G01-P ₃ ¹ -20	1: * to 7 {* to 71.4} 3: 3.5 to 25 {35.7 to 255} *See page D-16 for these items.	50		40	1.5	D-13	
-W ₃ ¹ -20		2.3							
-A ₃ ¹ -21		1.6							
-B ₃ ¹ -21									
Brake Valves (Direct Type)	ORO-G01-W ₃ ¹ -20	1: 0.8 to 7 {8.2 to 71.4} 3: 3.5 to 21 {35.7 to 214}	20		40	1.5	D-19		
	-A ₃ ¹ -20					1.4			
	-B ₃ ¹ -20								
Direct Relief Valves (Direct Type)	ORD-G01-W ₃ ¹ -20	1: 0.8 to 7 {8.2 to 71.4} 3: 3.5 to 21 {35.7 to 214}	20		40	1.5	D-23		
	-A ₃ ¹ -20					1.4			
	-B ₃ ¹ -20								
Reducing Valves (Direct Type)	OG-G01-P ₂ ^C 1-21	C: 0.15 to 3.5 {1.5 to 35.7} 1: 0.8 to 7 {8.2 to 71.4} 2: 3.5 to 16 {35.7 to 163}	50		40	1.3	D-28		
	-A ₂ ^C 1-21						D-37		
	-B ₂ ^C 1-21								
Balance Type Reducing Valves	OGB-G01-P ₃ ^C 1-20	C: 0.15 to 3.5 {1.5 to 35.7} 1: 0.8 to 7 {8.2 to 71.4} 3: 3.5 to 21 {35.7 to 214}	40		40	1.9	D-35		
	-A ₃ ^C 1-20								
	-B ₃ ^C 1-20								
Pressure Control Valves (Sequence Valves)	OQ-G01-P ₃ ¹ 2-20	1: 0.8 to 7{8.2 to 71.4} 3: 3.5 to 21{35.7 to 214}	40		40		D-47		
	Pressure Control Valves (Counter Balance Valves)	OCQ-G01-A ₂ ¹ 2-20				1: 0.8 to 7{8.2 to 71.4} 2: 3.5 to 14{35.7 to 143}	1.1	D-50	
Pressure Switches		OW-G01-P ₃ ^C 1-R**-30	C: 0.5 to 3.5 {5.1 to 35.7} 1: 0.8 to 7{8.2 to 71.4} 3: 3.5 to 21 {35.7 to 214}	50		40	1.8	D-55	
	-W ₃ ^C 1-R**-30	2.6							
	-A ₃ ^C 1-R**-30	1.8							
	-B ₃ ^C 1-R**-30								
Flow Control Valve	Flow Regulator Valve	OY-G01-T-20		50		40	1.0	D-58	
	Flow Regulator Valves with Check	OCY-G01-P-20	(0.04{0.4})						
		Meter-Out Flow Regulator Valves	OCY-G01-W-Y-20						(0.08{0.8})
	-A-Y-20		1.2						
		-B-Y-20							

G01 Modular Valve Series

Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	JIS Symbol P T B A	Height mm	Weight kg	Catalog Page	
Flow Control Valves	Meter-in Flow Regulator Valve	OCY-G01-W-X-20	(0.08{0.8})	50		40	1.3	D-58	
		-A-X-20							
		-B-X-20							
	Flow Control Valve	OF-G01-P20-20	(Control Flow Rate) Differential Pressure 7{71.4}:0.1 to 20 Differential Pressure 21{214}:0.3 to 20				1.2	D-66	
	Meter-out Flow Control Valves	OCF-G01-W40-Y-30	(Control Flow Rate) Differential Pressure 7{71.4}:0.1 to 40 Differential Pressure 25{255}:0.5 to 40	40		40	1.7		
		-A40-Y-30					1.5		
		-B40-Y-30					1.7		
	Meter-in Flow Control Valves	OCF-G01-W40-X-30	(Control Flow Rate) Differential Pressure 7{71.4}:0.1 to 40 Differential Pressure 25{255}:0.5 to 40	40		40	1.7		
		-A40-X-30					1.5		
		-B40-X-30							
Direction Control Valve	Check Valves	OC-G01-P ₂ ¹ -21	Cracking pressure [1:0.04{0.4}] [2:0.35{3.6}] [3:0.50{5.1}] *For differential circuit	50		40	1.0	D-72	
		T ₂ -21							
		-A ₂ -21 *							
		-AP ₂ -20 *							
	Vacuum Check Valves	OCV-G01-W-20	(0.015{0.15})	50			1.0		
	Pilot Check Valves	OCP-G01-W ₂ ¹ -(F)-21	Cracking pressure [1:0.2{2.0}] [2:0.5{5.1}] (Auxiliary Symbol) Open Valve Ratio Standard: Parent Valve 37% F: Child Valve 6% Parent Valve 51%	50		40	1.2	D-79	
		-A ₂ ¹ -(F)-21							
		-B ₂ ¹ -(F)-21							
	Composite Valves	2-pressure Reducing Valves	OGS-G01-P ₁ ^C -K(R)-**22 High pressure side Low pressure side Power supply : C1, C2, D1, D2	C:0.2 to 3.5 {2.0 to 35.7} 1:0.8 to 7 {8.2 to 71.4} 2:3.5 to 14 {35.7 to 143}	40		90	4.8	D-44
	Other	Gauge Modular Blocks	OK-G01-P-(H)-20		50		25 (H:40)	0.6 (H:1.0)	D-84
-T-(H)-20									
-W-(H)-20									
2-speed Plates		OB-G01-W-(H)-20		50		25 (H:40)	1.5 (H:2.5)	D-86	
End Plates		MOB-G01-(H)-10		-		20	0.3	D-88	
Free-flow plate		MOB-G01-A-10		50		36	0.6		
		-B-10							
Base Blocks (Multi-block)		MOB-01X-B*-10	B: A, B ports *: Sequential number from 2 to 6 Single side outlet						D-96
	-01Y-W*-10	W: A, B ports *: Sequential number from 1 to 6 Dual side outlet							
Sub Plate	MSA-01Y-10 MSA-01Y-T-10	None: Back side outlet T: Side outlet						D-90	

G03 Modular Valve Series

Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	JIS Symbol	Height mm	Weight kg	Catalog Page
Solenoid Valves	Solenoid Valves	For M6 For M8 SS-G03-**-R**-J22-22 SA-G03-**-** -J21-21		160				E-1 E-13
		Relief Valves (Balance Type)	OR-G03-P ₃ ¹ -J50	1: * to 7 { * to 71.4 } 3: 3.5 to 25 { 35.7 to 255 } (Auxiliary Symbol) V: With vent port *See page D-16 for these items.	80		55	3.1
-W ₃ ¹ -J50	3.9							
-A ₃ ¹ -J50	3.1							
-B ₃ ¹ -J50	3.1							
OR-G03-P ₃ ¹ -V-J50	3.1							
Pressure Control Valve	Brake Valves (Direct Type)	ORO-G03-W ₃ ¹ -J50	1: 0.8 to 7 { 8.2 to 71.4 } 3: 3.5 to 25 { 35.7 to 255 }	30		55	4.8	D-19
		-A ₃ ¹ -J50					4.0	
		-B ₃ ¹ -J50						
	Direct Relief Valves (Direct Type)	ORD-G03-W ₃ ¹ -J50	1: 0.8 to 7 { 8.2 to 71.4 } 3: 3.5 to 25 { 35.7 to 255 }	30		55	3.9	D-23
		-A ₃ ¹ -J50					3.1	
		-B ₃ ¹ -J50						
Reducing valve	OG-G03-P ₃ ^C 1-(B)-J51	C: 0.25 to 3.5 { 2.5 to 35.7 } 1: 0.8 to 7 { 8.2 to 71.4 } 3: 3.5 to 21 { 35.7 to 214 }	80 However, C: 50		55	3.6	D-28	
	-A ₃ ^C 1-(B)-J51						D-37	
	-B ₃ ^C 1-(B)-J51						D-28	
	OG-G03-P ₃ ^C 1-(B)V-J51							
Pressure Control Valves (Sequence Valves)	OQ-G03-P ₃ ^A 2C-J50	A: 0.25 to 0.85 { 2.5 to 8.7 } C: 0.85 to 3.5 { 8.7 to 35.7 } E: 3.5 to 14 { 35.7 to 143 }	80		55		D-47	
	OCQ-G03-A ₃ ^A 1C-J50						D-50	
	-B ₃ ^A 1C-J50							
Flow Control Valve	Flow Regulator Valve	OCY-G03-P ₃ ^P -H-J50	(Function) H: High differential pressure regulator (0.1{1})	100		55	2.9	D-58
	Meter-Out Flow Regulator Valves	-W-Y -W-HY -J51					3.1	
		-A-Y -A-HY -J51						
		-B-Y -B-HY -J51					3.0	

*There is no problem with seals and other parts when mixing these valves with NACHI G03 modular valve design number (J) 30 valves.

*G03 module valve installation bolts
For M6: Design number J50
For M8: Design number 50
Unit has commonality. Also, two J-pins have been inserted diagonally for M6 applications.

Note) G03 series modular valves have two T port locations: one on the A port side T_(A) and one on the B port side T_(B). The port that is used depends on the model number. See page D-11 for details about JIS symbols.

G03 Modular Valve Series

Type	Name	Valve Model Number	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	JIS Symbol				Height mm	Weight kg	Catalog Page	
					P	T	B	A				
Flow Control Valves	Meter-in Flow Regulator Valve	OCY-G03-W-X -W-HX -J51	(Function) H: High differential pressure regulator (0.1{1})	100					55	3.1	D-58	
		-A-X -A-HX -J51										
		-B-X -B-HX -J51										
	Flow Control Valve	OF-G03-P60-J50	(Control Flow Rate) Differential Pressure 7{71.4}:0.3 to 60 Differential Pressure 25{255}:0.5 to 60							3.1		
	Meter-out Flow Control Valves	OCF-G03-W60-Y-J50	(Volume control flow rate) Differential Pressure 7{71.4}:0.5 to 60 Differential Pressure 25{255}:1 to 60	60					55	5.0	D-66	
		-A60-Y-J50								4.6		
		-B60-Y-J50								5.0		
	Meter-in Flow Control Valves	OCF-G03-W60-X-J50	(Volume control flow rate) Differential Pressure 7{71.4}:0.5 to 60 Differential Pressure 25{255}:1 to 60	60					55	5.0	D-66	
		-A60-X-J50								4.6		
		-B60-X-J50								4.6		
Direction Control Valve	Check Valves	1 OC-G03-P2-J50 3	Cracking pressure 1:0.04{0.4} 2:0.35{3.6} 3:0.50{5.1} *For differential circuit 	100				55	2.7	D-72		
		1 T2-J50 3										
		1 -A2-J50 * 3										
		1 -AP2-J50 * 3										
	Vacuum Check Valves	OCV-G03-W-J50	(0.015{0.15})	100					55	3.5	D-72	
	Pilot Check Valves	1 OCP-G03-W ₂ -(D)-J50 3	Cracking pressure 1:0.2{2.0} 2:0.5{5.1} (Auxiliary Symbol) Open Valve Ratio Standard : Child Valve 7% Parent Valve 49% D : Parent Valve 49%	100				55	3.6	D-79		
-A ₂ -(D)-J50												
-B ₂ -(D)-J50												
Other	Gauge Block	OK-G03-J50		100					55	2.3	D-84	
	2-speed Plates	OB-G03-W-(H)-J30		100					35 (H:55)	4.5 (H:7.1)	D-86	
	End Plates	MOB-G03-J50: For M6 MOB-G03-(H)-50: For M8		-						32 (H:58)	1.4 (H:2.5)	D-88
		MOB-G03-A-J50: For M6 MOB-G03-A-(H)-50: For M8		100						32 (H:58)	1.3 (H:2.3)	
	Free Flow	MOB-G03-B-J50: For M6 MOB-G03-B-(H)-50: For M8		100						32 (H:58)	1.3 (H:2.3)	D-88
		MOB-G03-A-J50: For M6 MOB-G03-A-(H)-50: For M8		100						32 (H:58)	1.3 (H:2.3)	
	Conversion plate (For 03/01 conversion)	MOB-G03-AA-50 MOB-G03-AA-J50		50						45	2.3	D-96
	Base Blocks	MOB-03-B*-J30	*:Sequential number from 2 to 5 A, B port dual side outlet									
	Sub Plate	MSA-03(X)-10 MS-03(X)-30 MSA-03(X)-T-10 MS-03(X)-T-10	MSA : For M6 MS : For M8 None: Back side outlet T : Side outlet									D-90

D

Modular Valve

G03 Modular Valve Series Detailed JIS Symbols

Type	Valve Model Number	Detailed JIS Symbols	Type	Valve Model Number	Detailed JIS Symbols	
Solenoid Valves	For M6, M8 SS-G03-**-R**-J22 -22 SA-G03-**-** -J21 -21		Flow Control Valve	OF-G03-P60-J50		
				OFC-G03-W60-Y-J50		
				OFC-G03-A60-Y-J50		
Pressure Control Valve	OR-G03-P ¹ / ₃ -J50			OFC-G03-B60-Y-J50		
	OR-G03-W ¹ / ₃ -J50			OFC-G03-W60-X-J50		
	OR-G03-A ¹ / ₃ -J50			OFC-G03-A60-X-J50		
	OR-G03-B ¹ / ₃ -J50			OFC-G03-B60-X-J50		
	OR-G03-P ¹ / ₃ -V-J50			Direction Control Valve	OC-G03-P ¹ / ₂ -J50	
	ORO-G03-W ¹ / ₃ -J50				OC-G03-T ¹ / ₂ -J50	
	ORO-G03-A ¹ / ₃ -J50				OC-G03-A ¹ / ₂ -J50	
	ORO-G03-B ¹ / ₃ -J50				OC-G03-AP ¹ / ₂ -J50	
	ORD-G03-W ¹ / ₃ -J50				OCV-G03-W-J50	
	ORD-G03-A ¹ / ₃ -J50				OCP-G03-W ¹ / ₂ -J50	
	ORD-G03-B ¹ / ₃ -J50				OCP-G03-A ¹ / ₂ -J50	
	OG-G03-P ¹ / ₃ (-B)-J51				OCP-G03-B ¹ / ₂ -J50	
	OG-G03-A ¹ / ₃ (-B)-J51		OK-G03-J50			
	OG-G03-B ¹ / ₃ (-B)-J51		Other		OB-G03-W-J30	
	OG-G03-P ¹ / ₃ (-B)V-J51				MOB-G03-(H)-50	
OQ-G03-P ¹ / ₂ C-J50		MOB-G03-J50				
OCQ-G03-A ¹ / ₃ C-J50		MOB-G03-A(H)-50				
OCQ-G03-B ¹ / ₃ C-J50		MOB-G03-A-J50				
Flow Control Valve	OCY-G03-P-J50				MOB-G03-B(H)-50	
	OCY-G03-W-Y-J51			MOB-G03-B-J50		
	OCY-G03-A-Y-J51			MOB-G03-AA-50		
	OCY-G03-B-Y-J51			MOB-G03-AA-J50		
	OCY-G03-W-X-J51			MOB-03X-B*-50		
	OCY-G03-A-X-J51		MOB-03X-B*-J50			
	OCY-G03-B-X-J51		MS-03(X)-30			
		MSA-03(X)-10				
		MS-03(X)-T-10				
		MSA-03(X)-T-10				

G04 Modular Valve Series

Type	Name	Valve Model Number	Maximum Working Pressure	Maximum Flow Rate ℓ/min	Pressure Adjustment Range (Check Valve Cracking Pressure) MPa{kgf/cm ² }	JIS Symbol	Weight kg	Catalog Page					
Solenoid Valves	Solenoid Control Valves	DSS-G04-****-R-**-22	35MPa {357 kgf/cm ² }	300			15.0	E-45					
Pressure Control Valve	Relief valve	ORH-G04-P $\frac{1}{5}$ -10	35MPa {357kgf/cm ² }	300	1:0.8 to 7{8.2 to 71.4} 3:3.5 to 25{35.7 to 255}		7.0	D-13					
	Direct Relief Valves	ORH-G04-DW $\frac{1}{5}$ -10		50	1:0.8 to 7 {8.2 to 71.4}		6.5	D-23					
		ORH-G04-DA $\frac{1}{5}$ -10			3:3.5 to 25 {35.7 to 255}								
		ORH-G04-DB $\frac{1}{5}$ -10			5:7 to 35 {71.4 to 357}								
	Reducing valve	OGH-G04-P $\frac{1}{3}$ -(B)-10		300	1:0.8 to 7 {8.2 to 71.4}		8.0	D-28					
		OGH-G04-A $\frac{1}{3}$ -(B)-10			3:3.5 to 25 {35.7 to 255}				8.0	D-37			
		OGH-G04-B $\frac{1}{3}$ -(B)-10			(Auxiliary Symbol) B: External drain								
	Counter Balance Valves	OQH-G04-A1 $\frac{A}{C}$ E-10		300	A:0.25 to 0.85{2.5 to 8.7}		8.0	D-50					
		OQH-G04-B1 $\frac{A}{C}$ E-10			C:0.50 to 3.5{5.1 to 35.7}								
	Flow Control Valve	Flow Regulator Valves		OYH-G04-P-10	35MPa {357kgf/cm ² }		300	Check Valve Cracking Pressure 0.04{0.4}		4.7	D-58		
Meter-in Flow Regulator Valve		OYH-G04-W-X-10	300	Check Valve Cracking Pressure 0.1{1.0}		6.5	D-58						
		OYH-G04-A-X-10											
		OYH-G04-B-X-10											
Meter-Out Flow Regulator Valves		OYH-G04-W-Y-10	300	Check Valve Cracking Pressure 0.1{1.0}		6.5	D-58						
		OYH-G04-A-Y-10											
		OYH-G04-B-Y-10											
Meter-in Flow Control Valves		OFH-G04-W200-X-10	200	Check Valve Cracking Pressure 0.1{1.0}		11.1	D-66						
		OFH-G04-A200-X-10											
		OFH-G04-B200-X-10											
		Meter-out Flow Control Valves						OFH-G04-W200-Y-10		200	Check Valve Cracking Pressure 0.1{1.0}	11.1	D-66
								OFH-G04-A200-Y-10					
								OFH-G04-B200-Y-10					
Direction Control Valve	Check Valves	OCH-G04-P $\frac{1}{3}$ 2-10	35MPa {357kgf/cm ² }	300	1:0.04{0.4} 2:0.35{3.6} 3:0.50{5.1}		4.5	D-72					
		OCH-G04-T $\frac{1}{3}$ 2-10					6.5						
		OCH-G04-A $\frac{1}{3}$ 2-10					4.5						
		OCH-G04-AP $\frac{1}{3}$ 2-10					4.5						
	Vacuum Check Valves	OVH-G04-W-10		300	0.01{0.1}	6.5	D-72						
	Pilot Check Valves	OPH-G04-W $\frac{1}{2}$ -(D)-10		300	1:0.20{2.0} 2:0.50{5.1}	6.8	D-79						
		OPH-G04-A $\frac{1}{2}$ -(D)-10						(Auxiliary Symbol) Open Valve Ratio Standard : Child Valve 7% Parent Valve 50% D : Parent Valve 50%					
OPH-G04-B $\frac{1}{2}$ -(D)-10													
Others	Conversion plate (for 06/04 conversion)	MOB-G06-AA-5411A		300	G04 G06		10.0	D-88					

The G04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).



Relief Modular Valve

50 to 300ℓ/min
25,35MPa

Features

- ① This modular relief valve provides maximum pressure control for a hydraulic circuit.
- ② Wide ranging applicability Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²} Pressure Adjustment Range: 0.8 to 25, 35MPa {8.2 to 255, 357kgf/cm²}
- ③ Shockless unload, 2-pressure control, and other configurations are possible by switching the solenoid valve. Contact your agent for details.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OR-G01-P1-20 P3	1/8	25 {255}	50	* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	1.5	ISO 4401-03-02-0-05
OR-G01-W1-20 W3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	2.3	
OR-G01-A1-21 A3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	1.6	
OR-G01-B1-21 B3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	1.6	
OR-G03-P1-(V)-J50 P3	3/8	25 {255}	80	* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.1	ISO 4401-05-04-0-05
OR-G03-W1-J50 W3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.9	
OR-G03-A1-J50 A3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.1	
OR-G03-B1-J50 B3				* to 7{ * to 71.4} 3.5 to 25{35.7 to 255}	3.1	
ORH-G04-P1-10 P3 P5	1/2	35 {357}	300	* to 7{ * to 71.4} 3.5 to 25{35.7 to 255} 7 to 35{71.4 to 357}	7.0	ISO 4401-07-06-0-05

Note) *See the Flow Rate - Low Pressure characteristics on page D-16 for information about items marked with an asterisk.

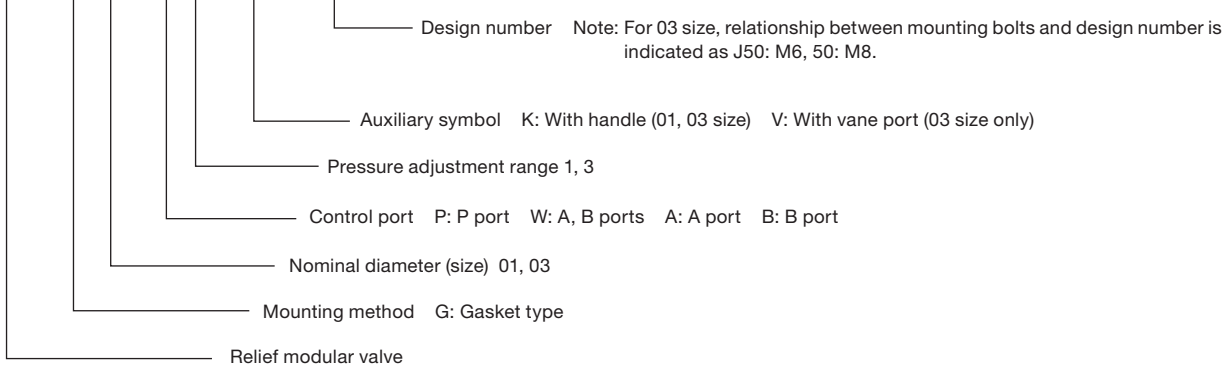
● Handling

- ① When using a remote control valve in a vent circuit, certain vent circuit pipe capacities can cause vibration. Because of this, thick steel pipe with an inside diameter of $\phi 4$ mm that is no longer than three meters is recommended. Vent piping cannot be used with the 01 size. If a vent port is required for the 03 size, add the auxiliary code "V".
- ② For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- ③ Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
- ④ A small control flow rate can cause pressure instability. Use a control flow rate that is in accordance with the values shown below.
01 size: At least 5ℓ/min
03 size: At least 8ℓ/min
04 size: At least 8ℓ/min
For applications that require a flow rate that is less than the minimum flow rate, use an ORD-G** direct type relieve modular valve.
- ⑤ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑥ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- ⑦ Connect OR-G03-W*-(J) 50 to the two T-ports on the tanks.

Explanation of model No.

01, 03 size

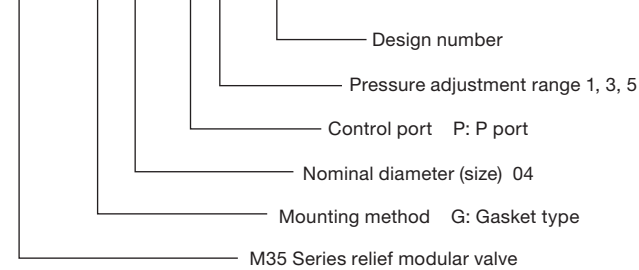
OR - G 03 - P 1 - (K) - J50



Explanation of model No.

04 size

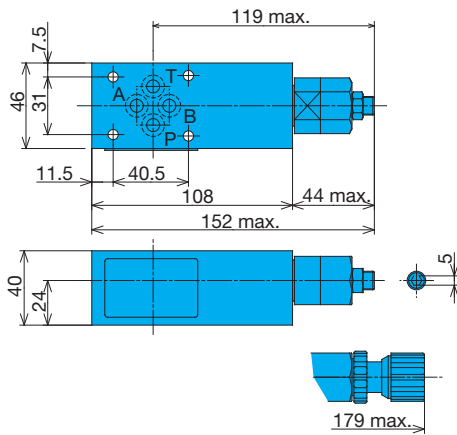
ORH - G 04 - P 5 - 10



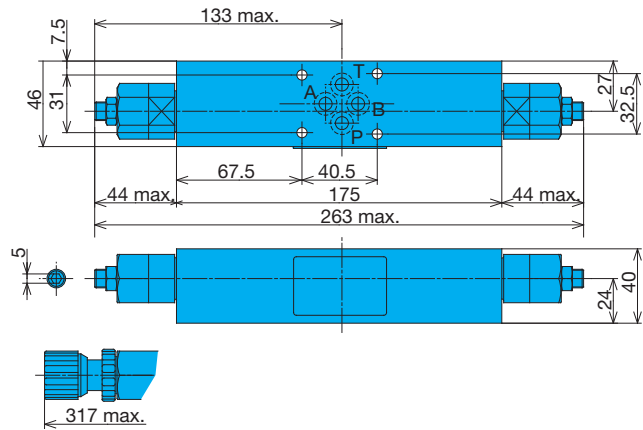
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

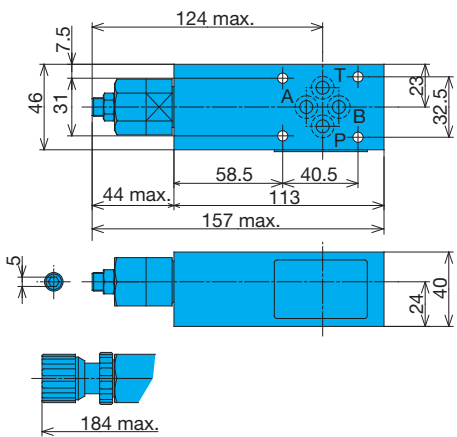
OR-G01-P*-20



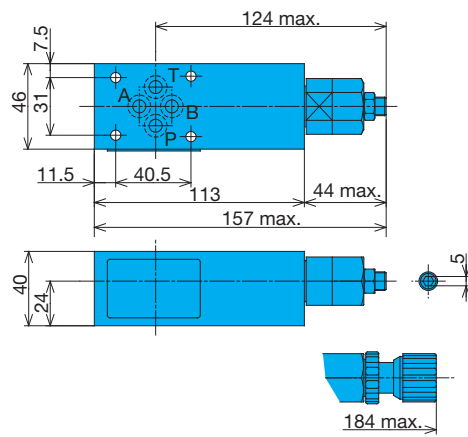
OR-G01-W*-20



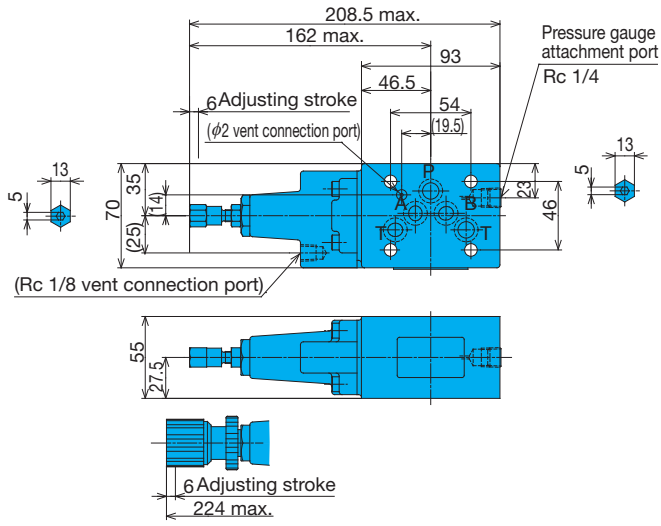
OR-G01-A*-21



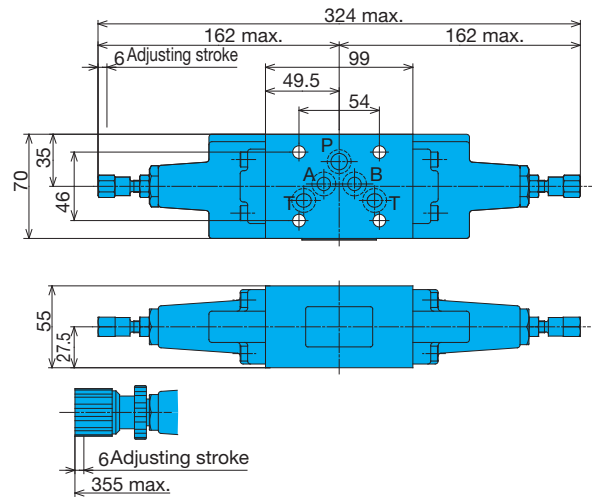
OR-G01-B*-21



OR-G03-P*-(V)-J50

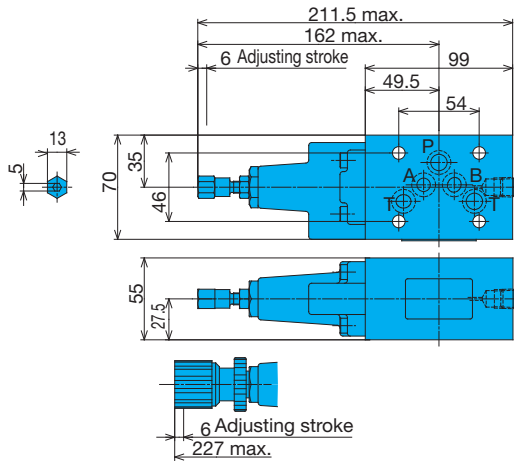


OR-G03-W*-(V)-J50

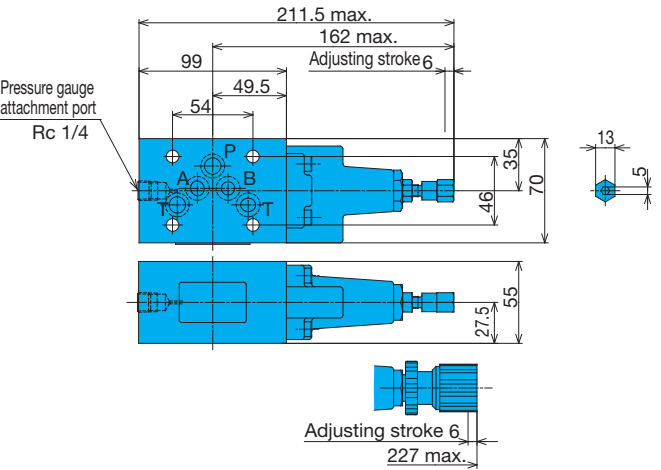


Note) Dimensions in parentheses show dimensions with vent port installed (V type)

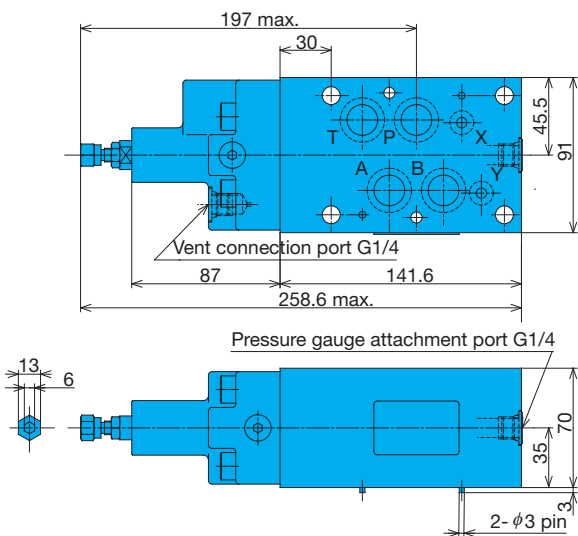
OR-G03-A*-(V)-J50



OR-G03-B*-(V)-J50



ORH-G04-P*-(V)-10

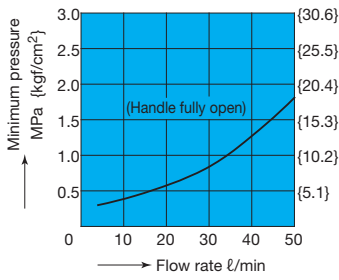


Performance Curves

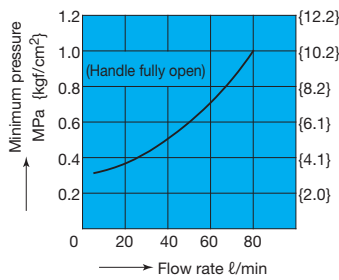
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Flow Rate – Minimum Pressure Characteristics

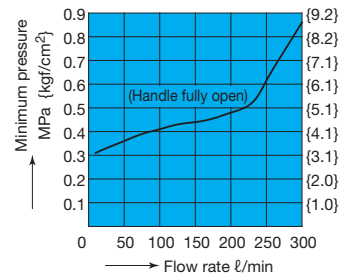
OR-G01-*1-20(21)



OR-G03-P1-J50

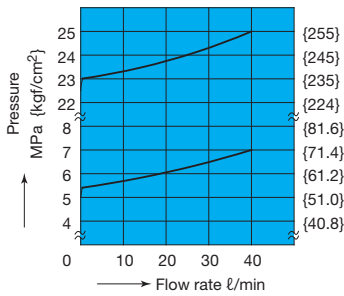


ORH-G04-P*-10

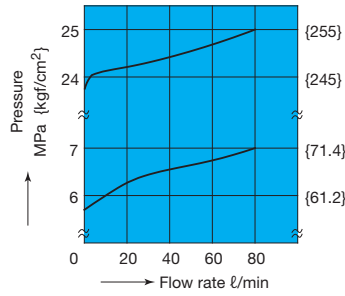


Pressure – Flow Rate Characteristics

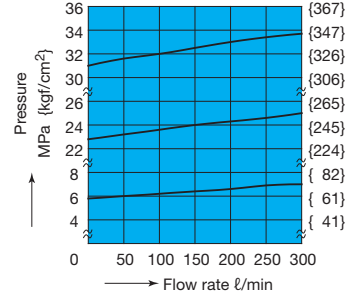
OR-G01-*1-20(21)



OR-G03-P*-J50

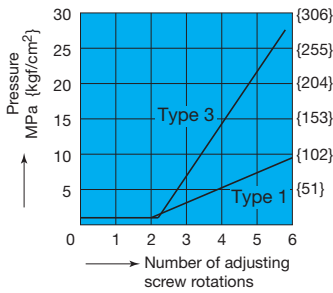


ORH-G04-P*-10

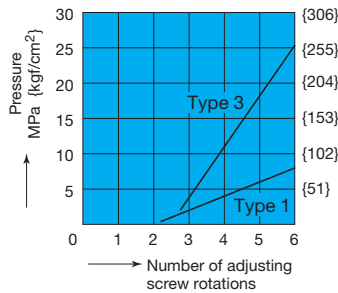


Number of Adjusting Screw Rotations – Pressure Characteristics

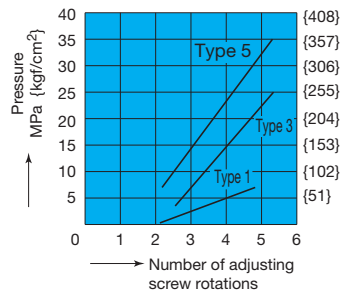
OR-G01-P*-20



OR-G03-P*-(J)50

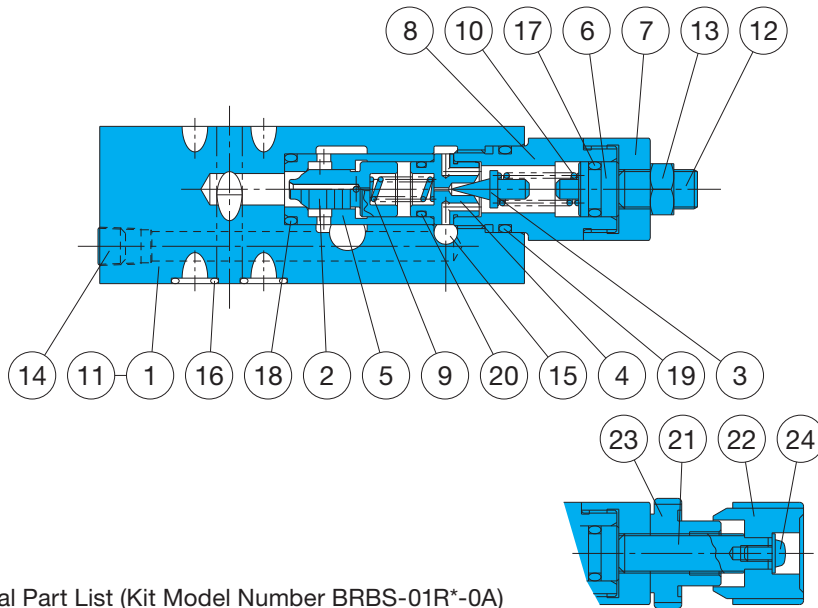


ORH-G04-P*-10



Cross-sectional Drawings

OR-G01-P*-20



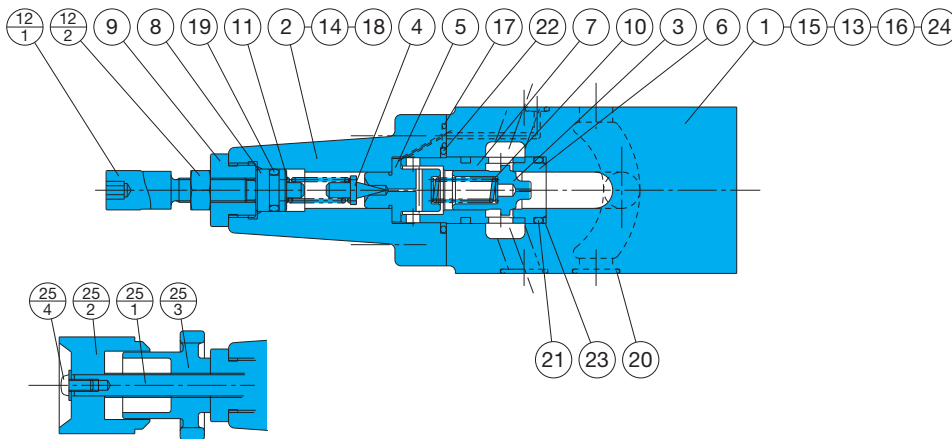
Part No.	Part Name
1	Body
2	Spool
3	Poppet
4	Seat
5	Sleeve
6	Plunger
7	Bushing
8	Retainer
9	Spring
10	Spring
11	Plate
12	Screw
13	Nut
14	Plug
15	Plug
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	Screw
22	Knob
23	Nut
24	Screw

Seal Part List (Kit Model Number BRBS-01R*-0A)

Part No.	Part Name	Part Number	Q'ty			
			P	W	A	B
16	O-ring	AS568-012(NBR-90)	4	4	4	4
17	O-ring	NBR-70-1 P10A	1	2	1	1
18	O-ring	NBR-90 P14	1	2	1	1
19	O-ring	NBR-90 P18	1	2	1	1
20	O-ring	AS568-013(NBR-90)	1	2	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, W, A, or B for the asterisk (*) in the kit model number.

OR-G03-P*-V-J50



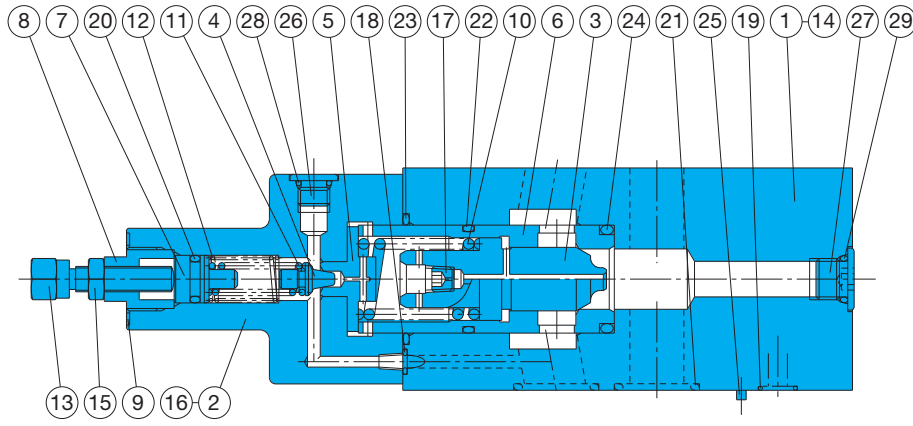
Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Seat
7	Sleeve
8	Plunger
9	Retainer
10	Spring
11	Spring
12	Screw kit
12-1	Screw
12-2	Nut
13	Plate
14	Screw
15	Plug
16	Plug
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	Backup ring
24	Pin
25	Handle kit
25-1	Screw
25-2	Knob
25-3	Nut
25-4	Screw

Seal Part List (Kit Model Number BRES-03R*)

Part No.	Part Name	Part Number	Q'ty		
			P/A/B	W	PV
17	O-ring	NBR-90 P5	-	-	2
18	O-ring	NBR-90 P7	1	2	1
19	O-ring	NBR-70-1 P10A	1	2	1
20	O-ring	AS568-014(NBR-90)	5	5	5
21	O-ring	NBR-90 P18	2	4	2
22	O-ring	AS568-119(NBR-90)	1	2	1
23	Backup ring	T2-P18	1	2	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Backup ring indicates JIS B2407-T2-*.
3. Specify P, W, or PV for the asterisk (*) in the kit model number.

ORH-G04-P*-10



Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Sleeve
7	Plunger
8	Retainer
9	Plate
10	Spring
11	Spring
12	Spring
13	Screw
14	Plate
15	Nut
16	Screw
17	Choke
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	O-ring
25	Pin
26	Plug
27	Plug
28	O-ring
29	O-ring

Seal Part List (Kit Model Number BRKS-04RP)

Part No.	Part Name	Part Number	Q'ty
18	O-ring	NBR-90 P5	1
19	O-ring	AS568-012(NBR-90)	2
20	O-ring	NBR-70-1 P11	1
21	O-ring	AS568-118(NBR-90)	4
22	O-ring	AS568-122(NBR-90)	1
23	O-ring	AS568-127(NBR-90)	1
24	O-ring	NBR-90 P28	1
28	O-ring	NBR-90 P8	3
29	O-ring	NBR-90 P11	3

Note) The materials and hardness of the O-ring conform with JIS B2401.



Brake Modular Valve

20 to 30ℓ/min
0.8 to 21, 25MPa

Features

- ① This modular pressure control valve prevents abnormal pressure when the actuator stops, enabling smooth stops.
- ② Wide ranging applicability Maximum operating pressure: 25MPa{255kgf/cm²}
- Pressure Adjustment Range: 0.8 to 21, 25MPa {8.2 to 214, 255kgf/cm²}

Specifications

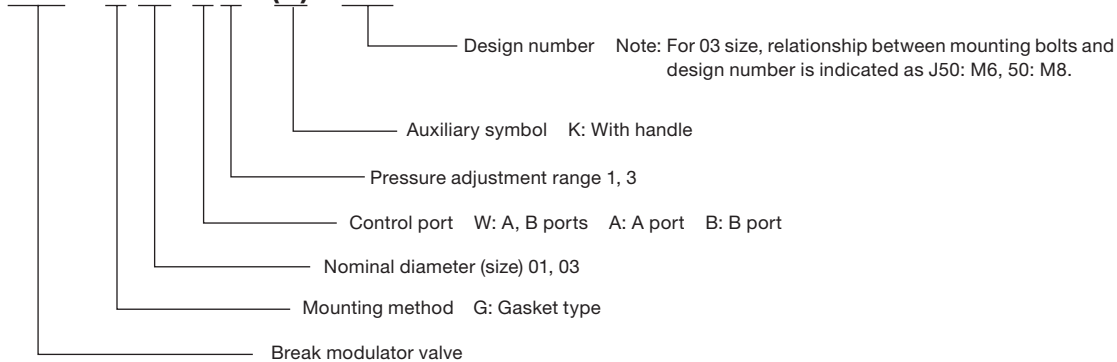
Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
ORO-G01-W1-20 W3	1/8	25 {255}	20	0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	1.5	ISO 4401-03-02-0-05
ORO-G01-A1-20 A3				0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	1.4	
ORO-G01-B1-20 B3				0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	1.4	
ORO-G03-W1-J50 W3	3/8	25 {255}	30	0.8 to 7 { 8.2 to 71.4 } 3.5 to 25 {35.7 to 255 }	4.8	ISO 4401-05-04-0-05
ORO-G03-A1-J50 A3				0.8 to 7 { 8.2 to 71.4 } 3.5 to 25 {35.7 to 255 }	4.0	
ORO-G03-B1-J50 B3				0.8 to 7 { 8.2 to 71.4 } 3.5 to 25 {35.7 to 255 }	4.0	

● Handling

- ① The pressure adjustment range is expressed using cracking pressure.
- ② For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- ③ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

Explanation of model No.

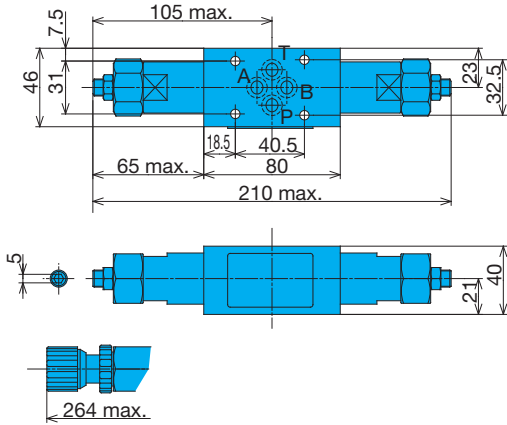
ORO - G 03 - A 3 - (K) - J50



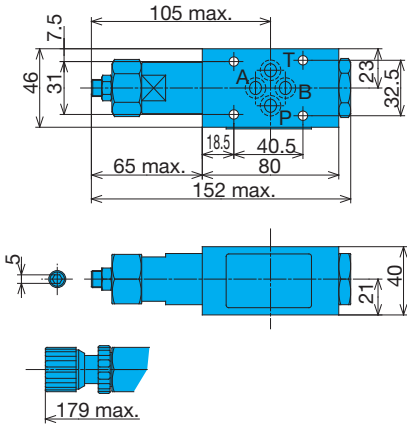
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

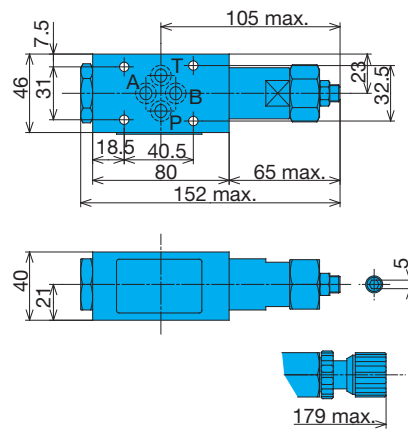
ORO-G01-W*-20



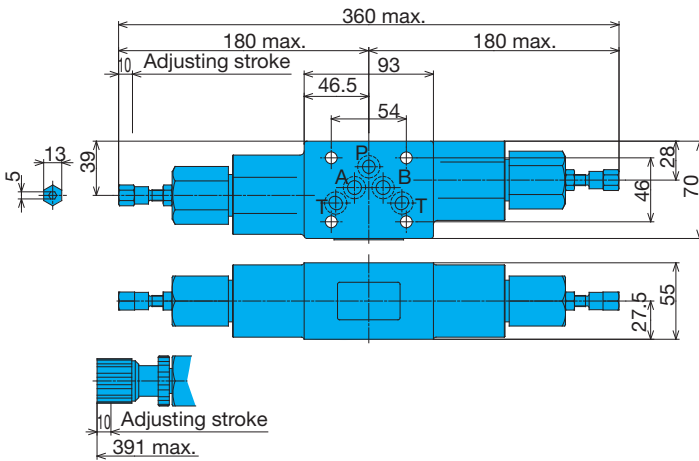
ORO-G01-A*-20



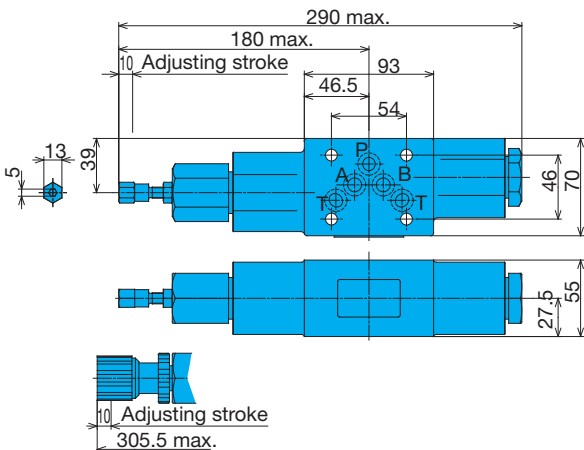
ORO-G01-B*-20



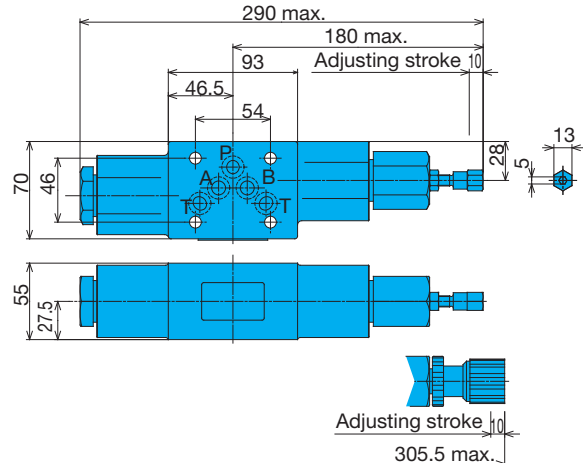
ORO-G03-W*-J50



ORO-G03-A*-J50



ORO-G03-B*-J50



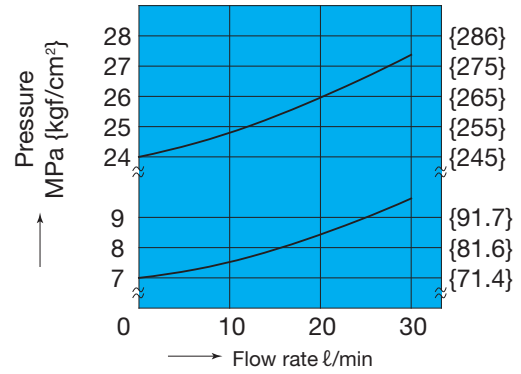
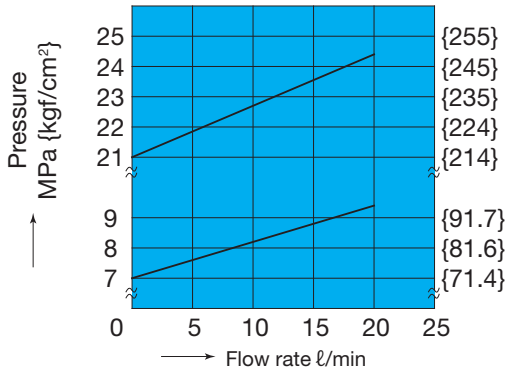
Performance Curves

Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure – Flow Rate Characteristics

ORO-G01-**-20

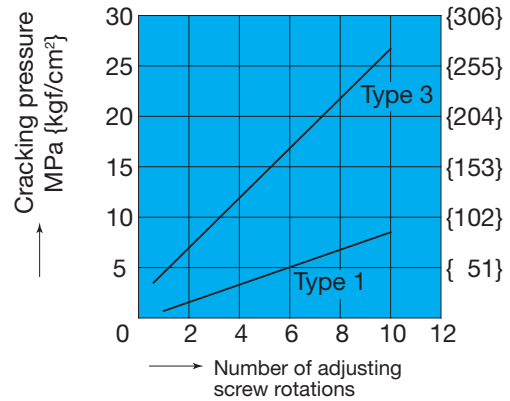
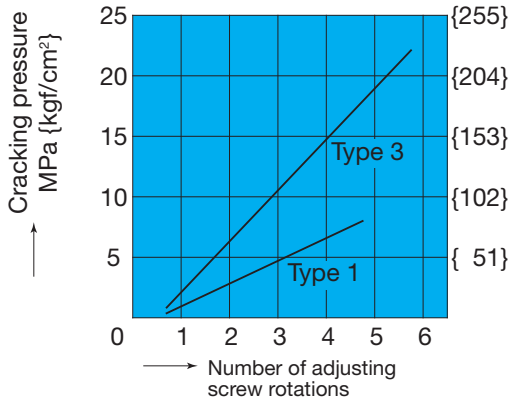
ORO-G03-**-J50



Number of Adjusting Screw Rotations – Pressure Characteristics

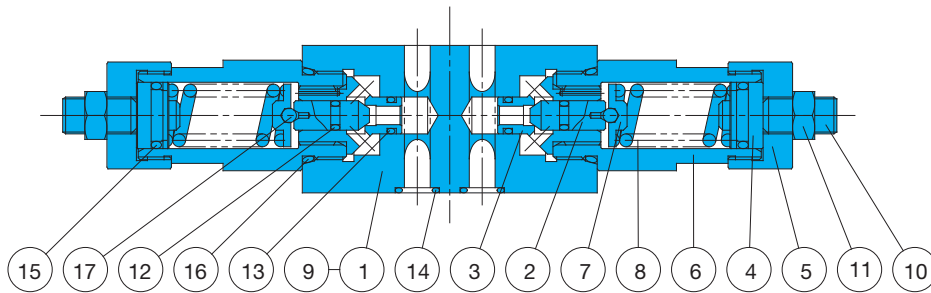
ORO-G01-**-20

ORO-G03-**-J50



Cross-sectional Drawings

ORO-G01-W*-20

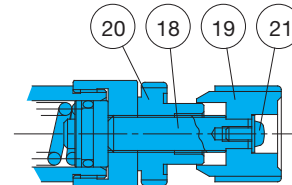


Part No.	Part Name
1	Body
2	Poppet
3	Seat
4	Plunger
5	Bushing
6	Retainer
7	Guide
8	Spring
9	Plate
10	Screw
11	Nut
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Ball
18	Screw
19	Knob
20	Nut
21	Screw

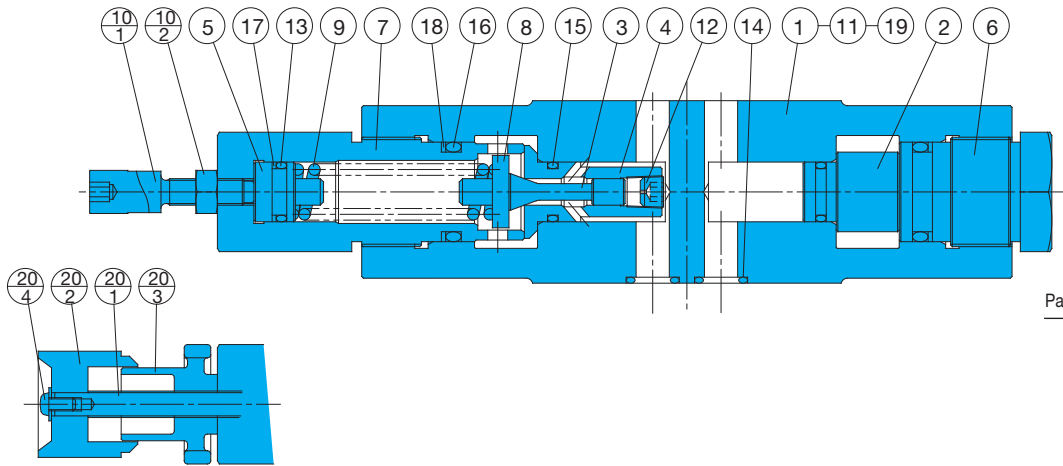
Seal Part List (Kit Model Number BRBS-01R0*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	NBR-70-1 P5	2	1	1
13	O-ring	NBR-90 P7	2	2	2
14	O-ring	AS568-012(NBR-90)	4	4	4
15	O-ring	NBR-90 P14	2	1	1
16	O-ring	NBR-90 P22	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify W, A, or B for the asterisk (*) in the kit model number.



ORO-G03-A*-J50



Part No.	Part Name
1	Body
2	Plug
3	Poppet
4	Seat
5	Plunger
6	Bushing
7	Retainer
8	Guide
9	Spring
10	Screw kit
10.1	Screw
10.2	Nut
11	Plate
12	Orifice
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Backup ring
18	Backup ring
19	Pin
20	Handle kit
20.1	Screw
20.2	Knob
20.3	Nut
20.4	Screw

Seal Part List (Kit Model Number BRES-03R0*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
13	O-ring	NBR-70-1 P14	2	1	1
14	O-ring	AS568-014(NBR90)	5	5	5
15	O-ring	NBR-90 P14	2	2	2
16	O-ring	NBR-90 P24	2	2	2
17	Backup ring	T2-P14	2	1	1
18	Backup ring	T2-P24	2	2	2

- Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Backup ring indicates JIS B2407-T2-**.
 3. Specify W, A, or B for the asterisk (*) in the kit model number.



Direct Relief Modular Valve

20 to 50ℓ/min
0.8 to 21,25,35MPa

Features

- ① This modular relief valve provides maximum pressure control for a hydraulic circuit.
 - ② Wide ranging applicability
Maximum Working Pressure: 25, 35 MPa {255, 357kgf/cm²}
- Pressure Adjustment Range: 0.8 to 21, 25, 35 MPa {8.2 to 255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
ORD-G01-W1-20 W3	1/8	25{255}	20	0.8 to 7{ 8.2 to 71.4}	1.5	ISO 4401-03-02-0-05
3.5 to 21{35.7 to 214}						
0.8 to 7{ 8.2 to 71.4}						
ORD-G01-A1-20 A3				3.5 to 21{35.7 to 214}	1.4	
ORD-G01-B1-20 B3				3.5 to 21{35.7 to 214}	1.4	
ORD-G03-W1-J50 W3	3/8	25{255}	30	0.8 to 7{ 8.2 to 71.4}	4.8	ISO 4401-05-04-0-05
3.5 to 25{35.7 to 255}						
0.8 to 7{ 8.2 to 71.4}						
ORD-G03-A1-J50 A3				3.5 to 25{35.7 to 255}	4.0	
ORD-G03-B1-J50 B3				3.5 to 25{35.7 to 255}	4.0	
ORH-G04-DW1-10 DW3 DW5	1/2	35{357}	50	0.8 to 7{ 8.2 to 71.4}	6.5	ISO 4401-07-06-0-05
3.5 to 25{35.7 to 255}						
7 to 35{71.4 to 357}						
ORH-G04-DA1-10 DA3 DA5				3.5 to 25{35.7 to 255}	6.5	
ORH-G04-DB1-10 DB3 DB5				7 to 35{71.4 to 357}	6.5	

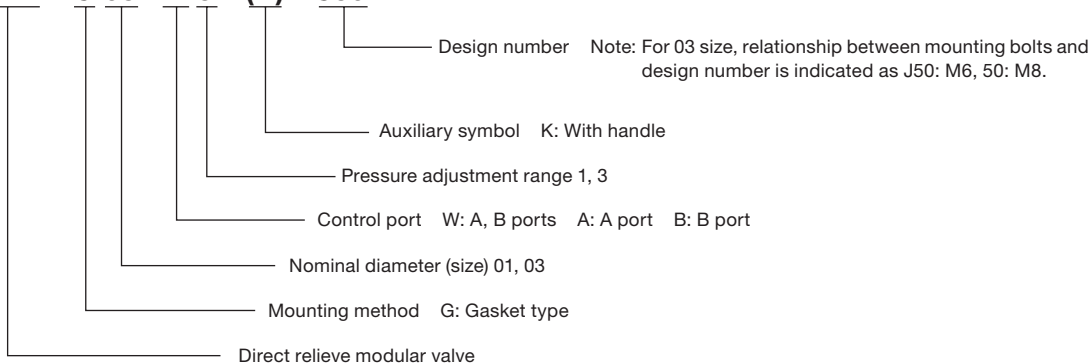
● Handling

- ① The pressure adjustment range is expressed in terms of cracking pressure.
- ② For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- ③ Tank port back pressure changes cracking pressure by the corresponding amount.
- ④ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑤ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

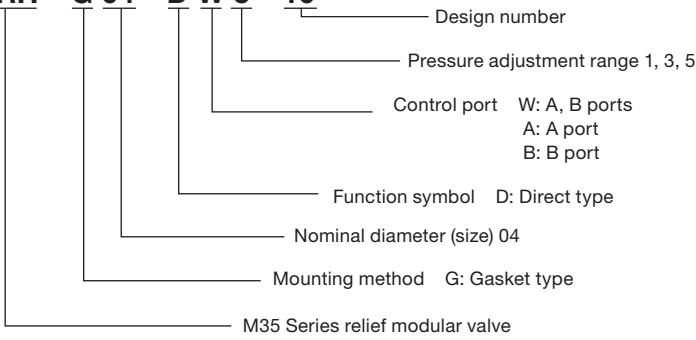
ORD - G 03 - W 3 - (K) - J50



Explanation of model No.

04 size

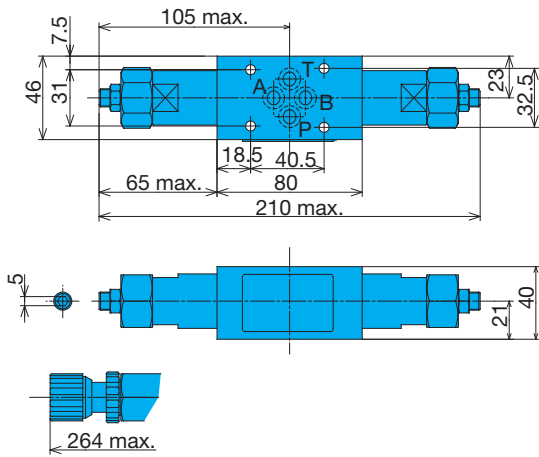
ORH - G 04 - D W 5 - 10



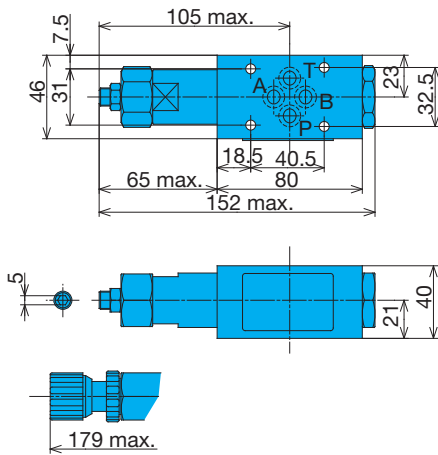
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

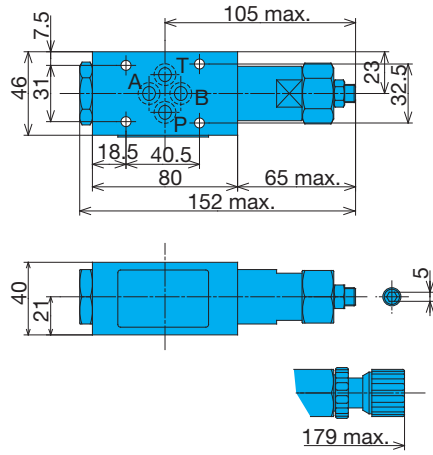
ORD-G01-W*-20



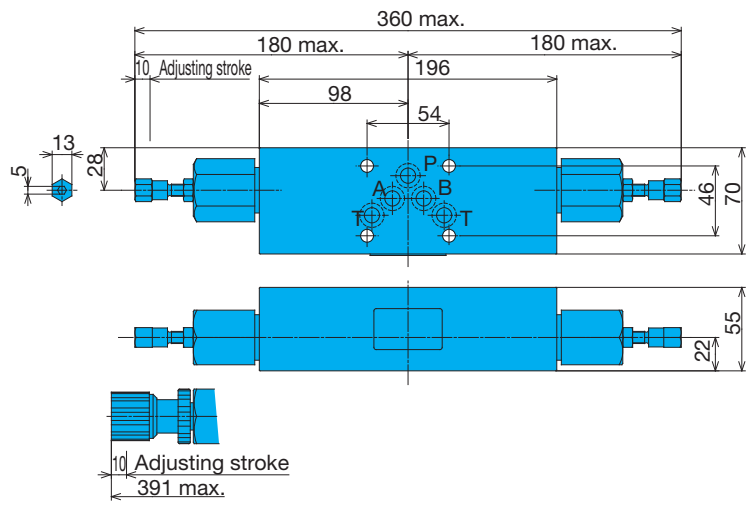
ORD-G01-A*-20



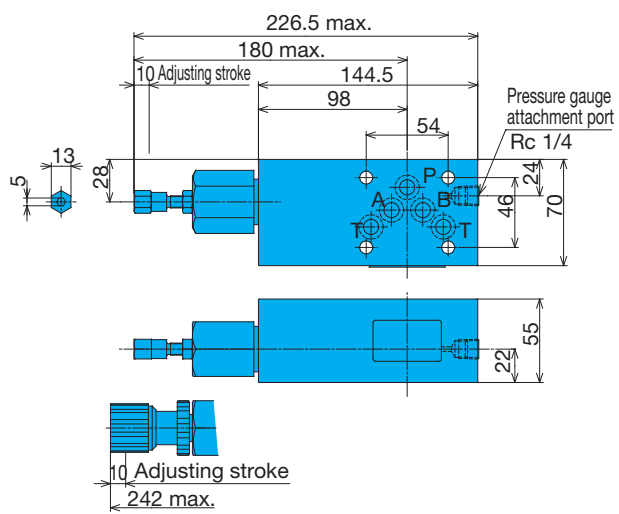
ORD-G01-B*-20



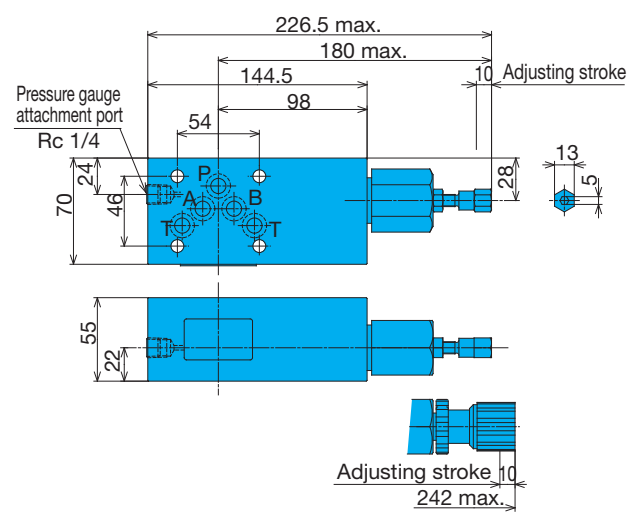
ORD-G03-W*-J50



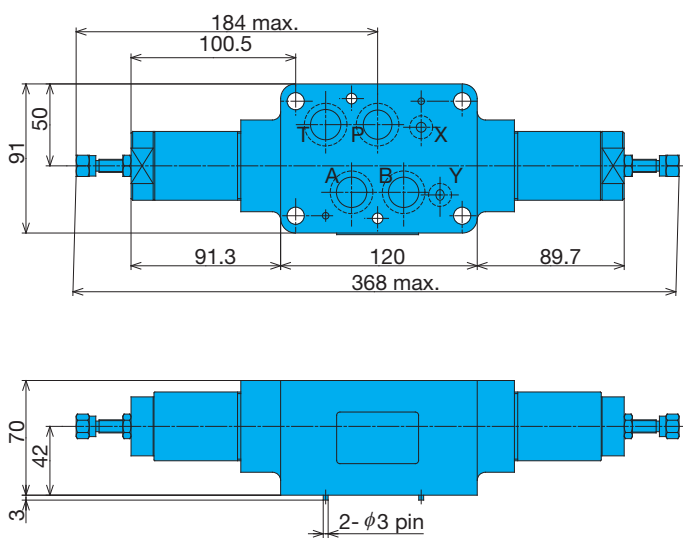
ORD-G03-A*-J50



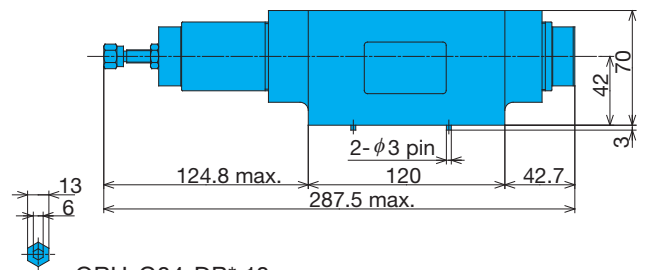
ORD-G03-B*-J50



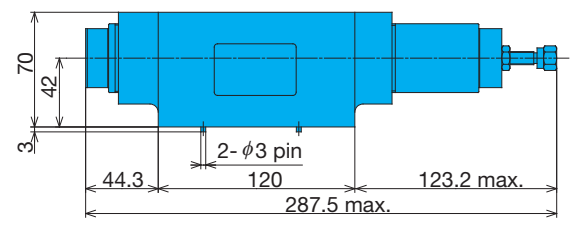
ORH-G04-DW*-10



ORH-G04-DA*-10



ORH-G04-DB*-10

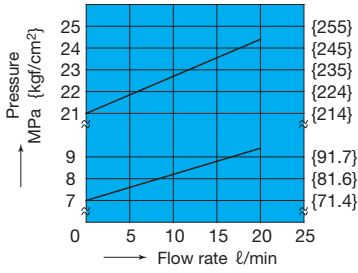


Performance Curves

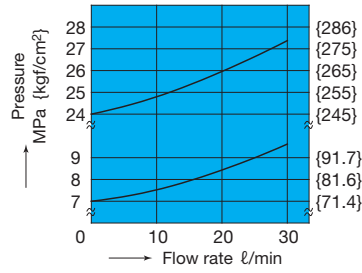
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure – Flow Rate Characteristics

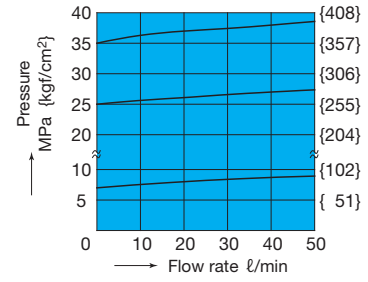
ORD-G01-**-20



ORD-G03-**-J50

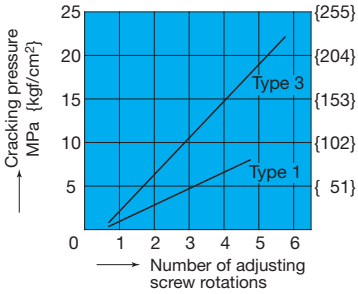


ORH-G04-DW*-10

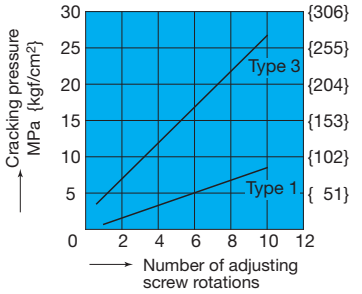


Number of Adjusting Screw Rotations – Pressure Characteristics

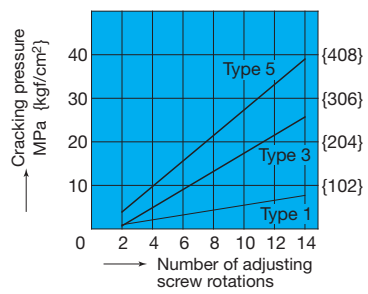
ORD-G01-**-20



ORD-G03-**-J50

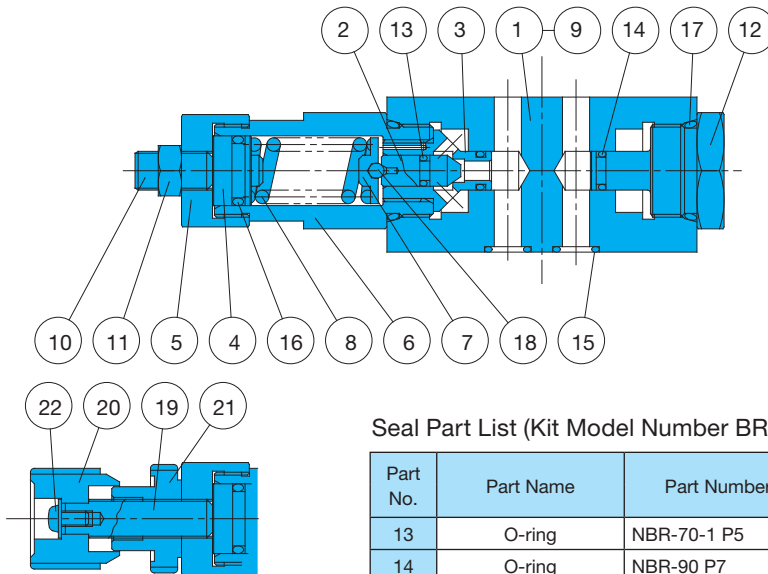


ORH-G04-DW*-10



Cross-sectional Drawings

ORD-G01-A*-20



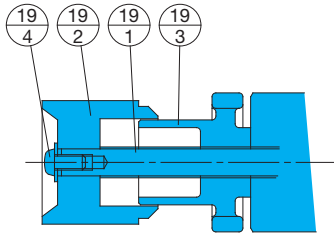
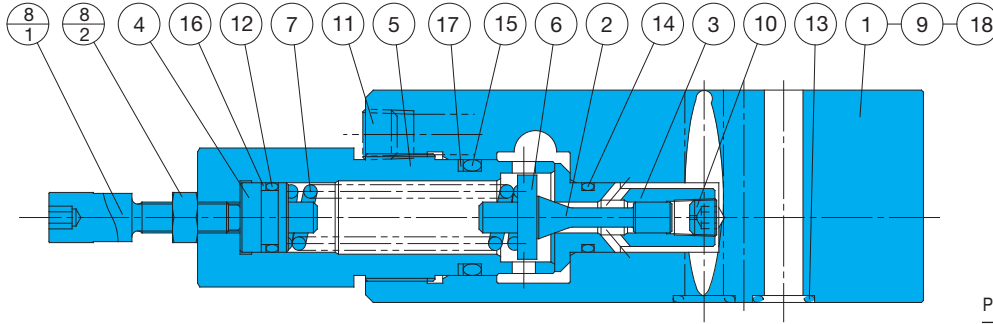
Seal Part List (Kit Model Number BRBS-01RD*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
13	O-ring	NBR-70-1 P5	2	1	1
14	O-ring	NBR-90 P7	2	2	2
15	O-ring	AS568-012(NBR-90)	4	4	4
16	O-ring	NBR-90 P14	2	1	1
17	O-ring	NBR-90 P22	2	2	2

Note) 1.The materials and hardness of the O-ring conform with JIS B2401.
2.Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Poppet
3	Seat
4	Plunger
5	Bushing
6	Retainer
7	Guide
8	Spring
9	Plate
10	Screw
11	Nut
12	Bushing
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	O-ring
18	Ball
19	Screw
20	Knob
21	Nut
22	Screw

ORD-G03-A*-J50



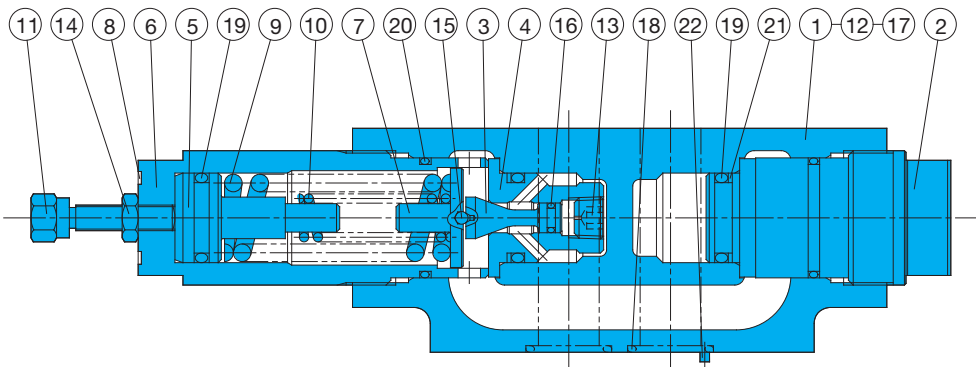
Seal Part List (Kit Model Number BRES-03RD*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	NBR-70-1 P14	1	1	2
13	O-ring	AS568-014(NBR-90)	5	5	5
14	O-ring	NBR-90 P14	1	1	2
15	O-ring	NBR-90 P24	1	1	2
16	Backup ring	T2-P14	1	1	2
17	Backup ring	T2-P24	1	1	2

Note) 1.The materials and hardness of the O-ring conform with JIS B2401.
 2.Backup ring indicates JIS B2407-T2-**.
 3.Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Poppet
3	Seat
4	Plunger
5	Retainer
6	Guide
7	Spring
8	Screw kit
8-1	Screw
8-2	Nut
9	Plate
10	Orifice
11	Plug
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	Backup ring
17	Backup ring
18	Pin
19	Handle kit
19-1	Screw
19-2	Knob
19-3	Nut
19-4	Screw

ORH-G04-DA*-10



Seal Part List (Kit Model Number BRKS-04RD*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
16	O-ring	NBR-70-1 P6	2	1	1
17	O-ring	AS568-012(NBR-90)	2	2	2
18	O-ring	AS568-118(NBR-90)	4	4	4
19	O-ring	NBR-90 P22A	4	3	3
20	O-ring	AS568-125(NBR-70-1)	2	2	2
21	Backup ring	T2-P22A	2	2	2

Note) 1.The materials and hardness of the O-ring conform with JIS B2401.
 2.Backup ring indicates JIS B2407-T2-**.
 3.Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Plug
3	Poppet
4	Seat
5	Plunger
6	Retainer
7	Guide
8	Plate
9	Spring
10	Spring
11	Screw
12	Plate
13	Choke
14	Nut
15	Ball
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	Backup ring
22	Pin



Pressure Reducing Modular Valve

40 to 300ℓ/min
25,35MPa

Features

- ① This modular valve makes the pressure in part of the circuit lower than that of the main circuit.
- ② Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.
- ③ Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OG-G01-PC-21 P1 P2	1/8	25 {255}	50	0.15 to 3.5{ 1.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 16{35.7 to 163}	1.3	ISO 4401-03-02-0-05
OG-G03-PC-(V)-J51 P1 P3	3/8	25 {255}	80 but C : 50	0.25 to 3.5{ 2.5 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	3.8	ISO 4401-05-04-0-05
OGH-G04-P1-10 P3	1/2	35 {357}	300	0.8 to 7{ 8.2 to 71.4} 3.5 to 25{35.7 to 255}	8.0	ISO 4401-07-06-0-05

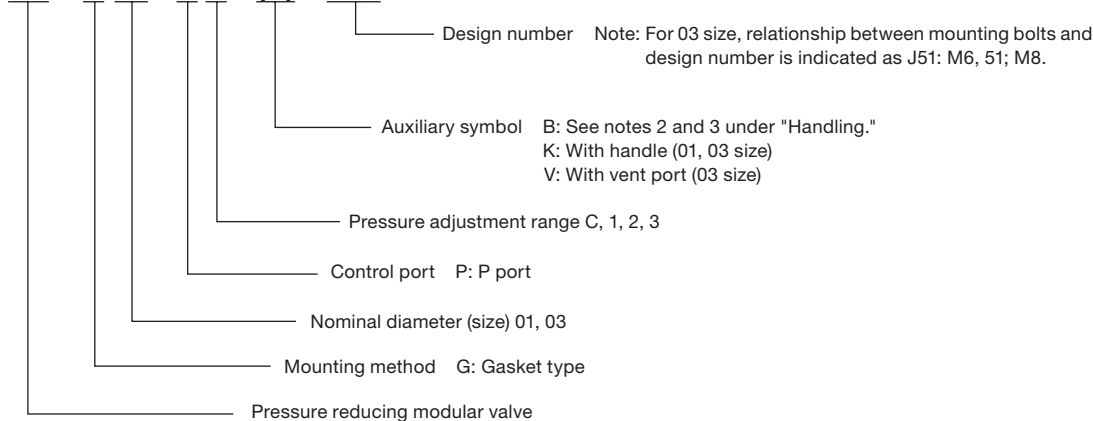
● Handling

- ① When using a remote control valve in a vent circuit, certain vent circuit pipe capacities can cause vibration. Because of this, thick steel pipe with an inside diameter of ϕ 4mm that is no longer than three meters is recommended. Vent piping cannot be used with the 01 size. If a vent port is required for the 03 size, add the auxiliary code "V".
- ② For the 03 size, the drainage can be allowed to escape through the T port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- ③ With the 04 sizes, piping is not required because drainage can be allowed to escape from the gasket side drain port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- ④ Note that a change in drain back pressure causes a change in setting pressure.
- ⑤ With the 01, 03 sizes, the flow rate is limited at low pressures. See the Pressure- Flow Rate Characteristics on pages D-30 for more information.
- ⑥ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑦ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- ⑧ With the 03, 04 sizes, the control port can be changed by altering the attachment orientation of the back cover. See the installation diagram for more information. After making this change, be sure also to make the other changes in accordance with the model number indicated on the nameplate.

Explanation of model No.

01, 03, size

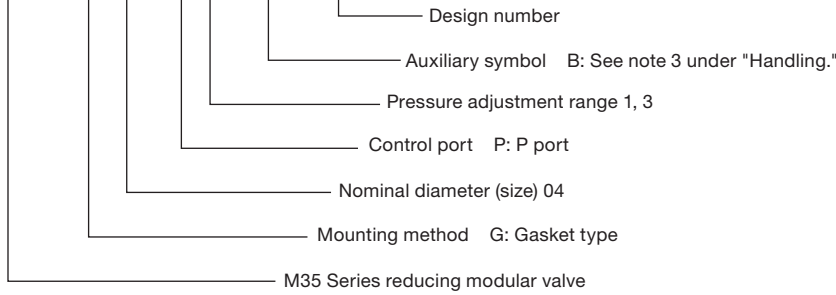
OG - G 03 - P 1 - (B) - J51



Explanation of model No.

04 size

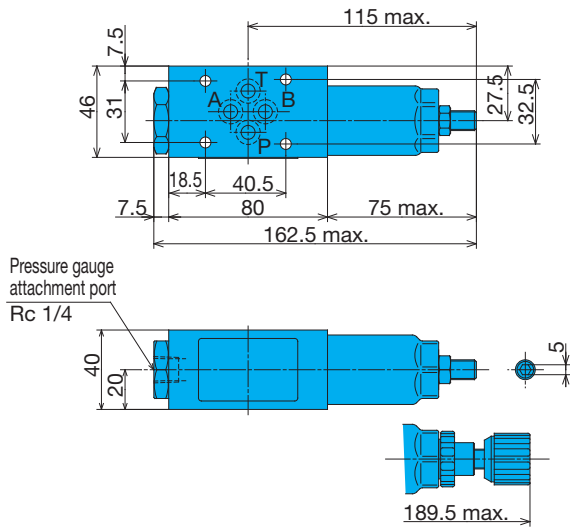
OGH - G 04 - P 1 - (B) - 10



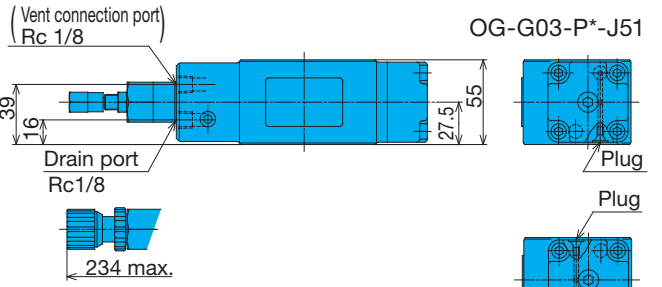
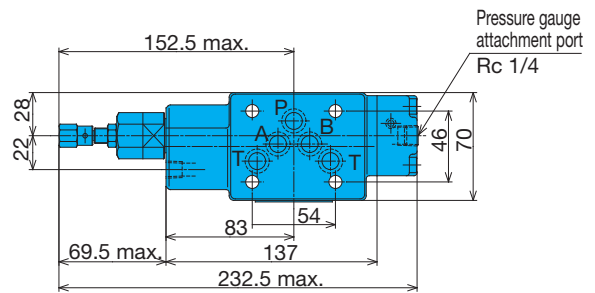
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OG-G01-P*-21



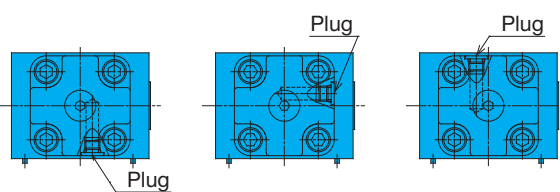
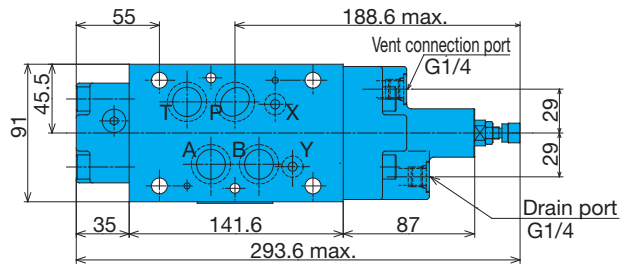
OG-G03-P*-(V)-J51



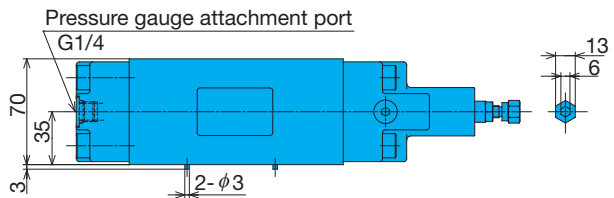
- Note) 1. Conversion to B port control is possible by changing the back cover. Port control is determined by plug orientation.
 2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
 3. The tightening torque of the back cover bolts is: (M6) 10 to 13Nm (102 to 133 kgf-cm).

OGH-G04-P*-10

- Note) 1. Conversion to A, B port control is possible by changing the back cover. Port control is determined by plug orientation.
 2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
 3. The tightening torque of the back cover bolts is: (M10) 45 to 55Nm (460 to 560 kgf-cm).



OGH-G04-B*-10 OGH-G04-A*-10 OGH-G04-P*-10

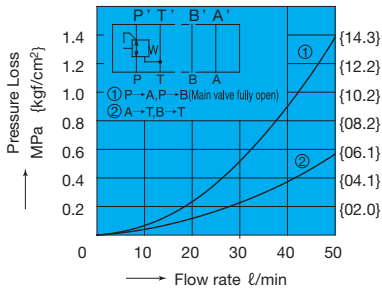


Performance Curves

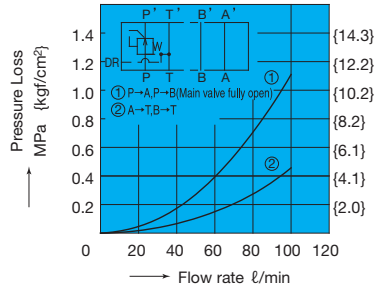
Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

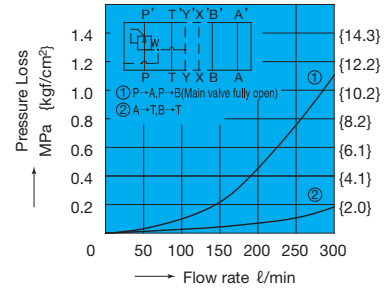
OG-G01-P*-21



OG-G03-P*-J51

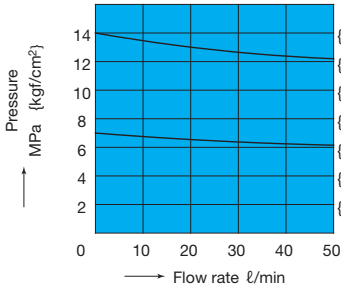


OGH-G04-**-10

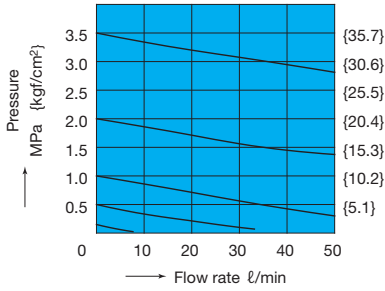


Pressure – Flow Rate Characteristics

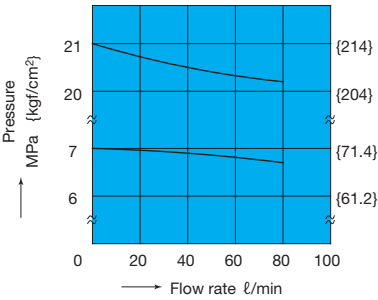
OG-G01-P₂¹-21



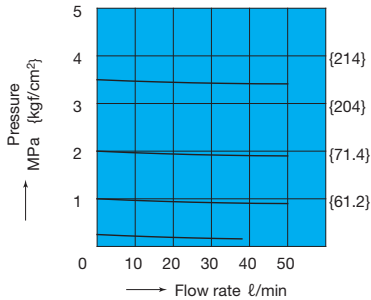
OG-G01-PC-21



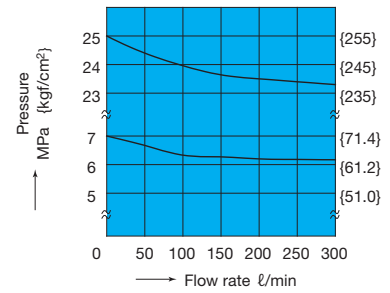
OG-G03-P₃¹-J51



OG-G03-PC-J51

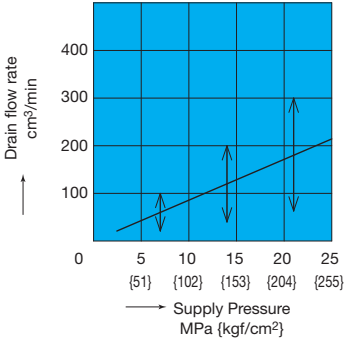


OGH-G04-**-10

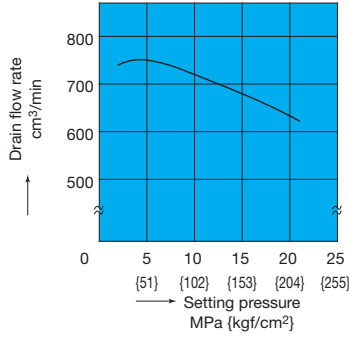


Pressure – Drain Rate Characteristics

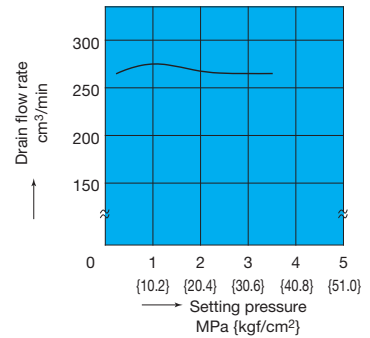
OG-G01-P*-21



OG-G03-P*-J51

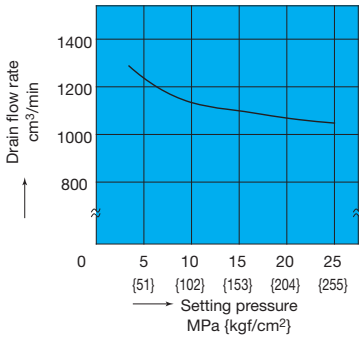


OG-G03-PC-J51



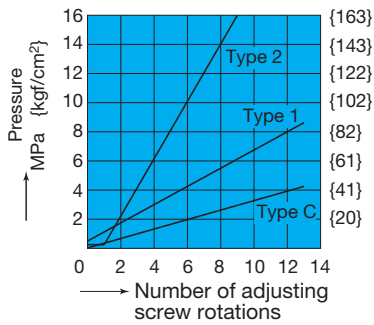
Determine it through the maximum value when designing the circuit.

OGH-G04-P3-10

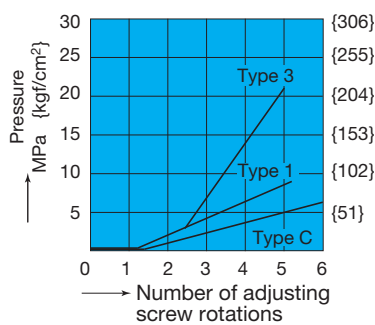


Number of Adjusting Screw Rotations – Pressure Characteristics

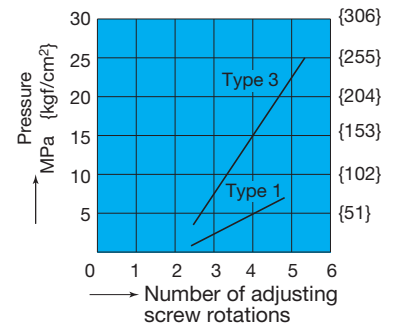
OG-G01-P*-21



OG-G03-P*-51

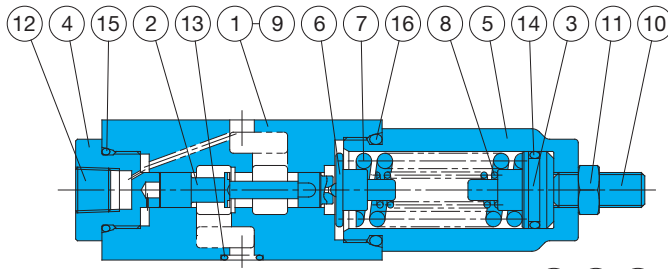


OGH-G04-P*-10



Cross-sectional Drawings

OG-G01-P2-21

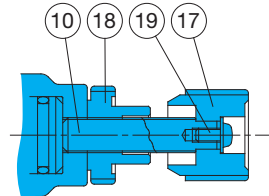


Part No.	Part Name
1	Body
2	Spool
3	Push rod
4	Bushing
5	Retainer
6	Guide
7	Spring
8	Spring
9	Plate
10	Screw
11	Nut
12	Plug
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Knob
18	Nut
19	Screw

Seal Part List (Kit Model Number BRBS-01GP-0A)

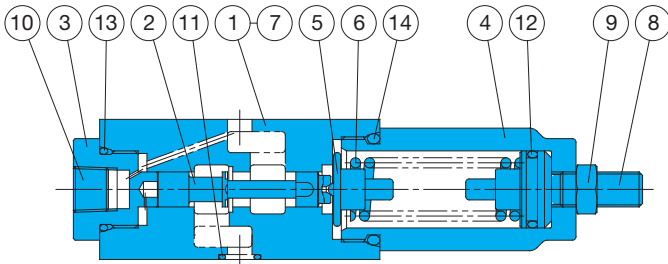
Part No.	Part Name	Part Number	Q'ty
			P
13	O-ring	AS568-012(NBR-90)	4
14	O-ring	NBR-70-1 P18	1
15	O-ring	NBR-90 P20	1
16	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.



Note) Part number 8 is used in the case of pressure adjustment range type 2 only.

OG-G01-PC-21

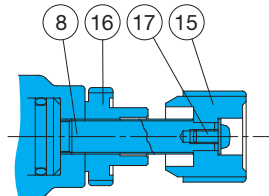


Part No.	Part Name
1	Body
2	Spool
3	Bushing
4	Retainer
5	Guide
6	Spring
7	Plate
8	Screw
9	Nut
10	Plug
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Knob
16	Nut
17	Screw

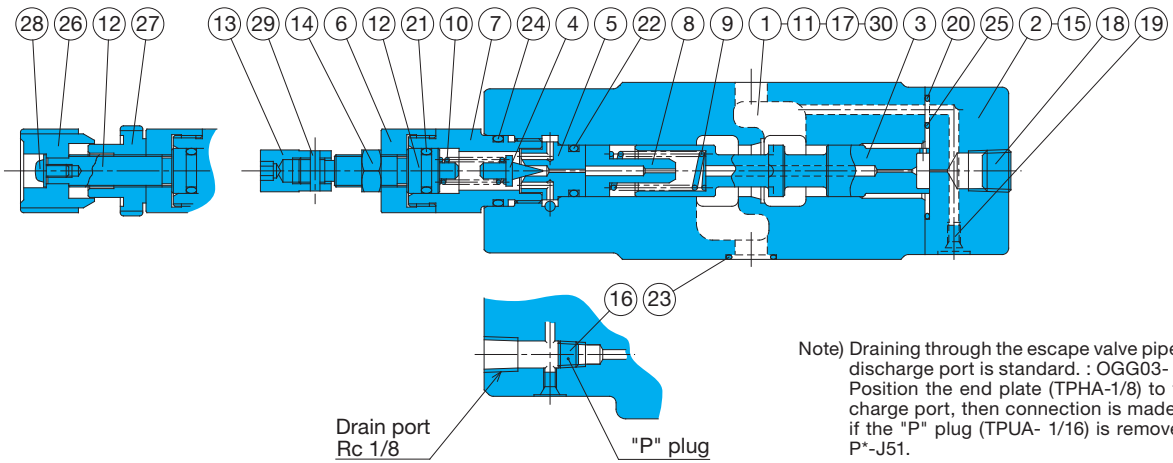
Seal Part List (Kit Model Number BRBS-01GP-0A)

Part No.	Part Name	Part Number	Q'ty
			P
11	O-ring	AS568-012(NBR-90)	4
12	O-ring	NBR-70-1 P18	1
13	O-ring	NBR-90 P20	1
14	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.



OG-G03-P*-J51



Note) Draining through the escape valve piped to the drain discharge port is standard. : OGG03- P*-B-J51
Position the end plate (TPHA-1/8) to the drain discharge port, then connection is made to the T port if the "P" plug (TPUA- 1/16) is removed. :OG-G03-P*-J51.

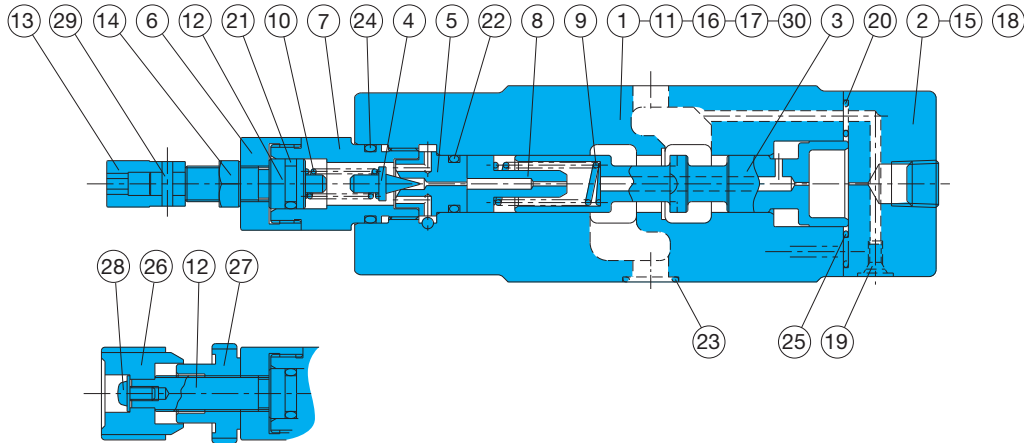
Seal Part List (Kit Model Number BRES-03GP-1A)

Part No.	Part Name	Part Number	Q'ty	
			P	
20	O-ring	NBR-90 P6	2	
21	O-ring	NBR-70-1 P10A	1	
22	O-ring	NBR-90 P12	1	
23	O-ring	AS568-014(NBR-90)	5	
24	O-ring	NBR-90 P18	1	
25	O-ring	AS568-023(NBR-90)	1	

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name	Part No.	Part Name
1	Body	14	Nut
2	Cover	15	Screw
3	Spool	16	Plug
4	Poppet	17	Plug
5	Seat	18	Plug
6	Bushing	19	Plug
7	Retainer	20	O-ring
8	Choke	21	O-ring
9	Spring	22	O-ring
10	Spring	23	O-ring
11	Plate	24	O-ring
12	Screw	25	O-ring
13	Nut	26	Knob
		27	Nut
		28	Screw
		29	Pin
		30	Pin

OG-G03-PC-J51



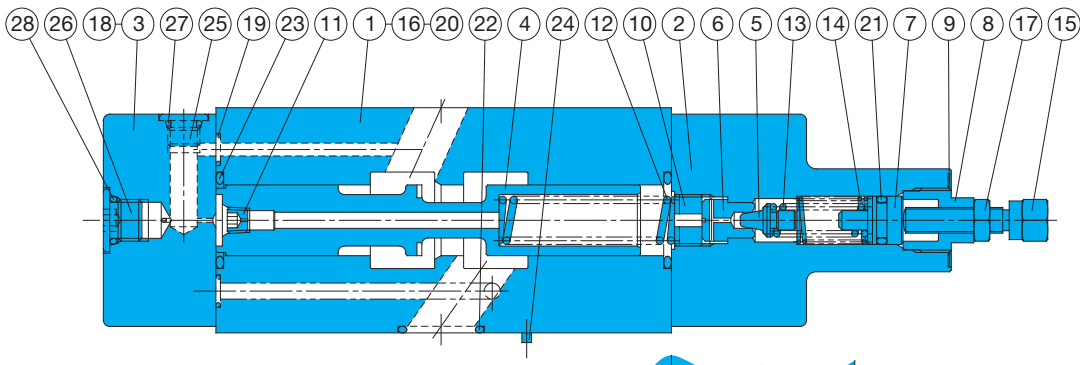
Seal Part List (Kit Model Number BRES-03GP*-1A)

Part No.	Part Name	Part Number	Q'ty	
			P	
20	O-ring	NBR-90 P6	2	
21	O-ring	NBR-70-1 P10A	1	
22	O-ring	NBR-90 P12	1	
23	O-ring	AS568-014(NBR-90)	5	
24	O-ring	NBR-90 P18	1	
25	O-ring	AS568-023(NBR-90)	1	

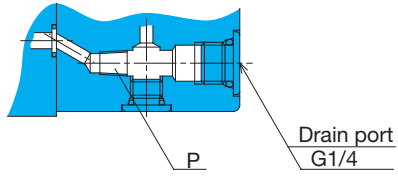
Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name	Part No.	Part Name
1	Body	16	Plug
2	Cover	17	Plug
3	Spool	18	Plug
4	Poppet	19	Plug
5	Seat	20	O-ring
6	Bushing	21	O-ring
7	Retainer	22	O-ring
8	Choke	23	O-ring
9	Spring	24	O-ring
10	Spring	25	O-ring
11	Plate	26	Knob
12	Screw	27	Nut
13	Nut	28	Screw
14	Nut	29	Pin
15	Screw	30	Pin

OGH-G04-P*-10



Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Spool
5	Poppet
6	Seat
7	Plunger
8	Retainer
9	Plate
10	Collar
11	Choke
12	Spring
13	Spring
14	Spring
15	Screw
16	Plate
17	Nut
18	Screw
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	Pin
25	Plug
26	Plug
27	O-ring
28	O-ring



Seal Part List (Kit Model Number BRKS-04**)

Part No.	Part Name	Part Number	Q'ty	
			G	GB
19	O-ring	NBR-90 P7	4	4
20	O-ring	AS568-012(NBR-90)	2	2
21	O-ring	NBR-70-1 P11	1	1
22	O-ring	AS568-118(NBR-90)	4	4
23	O-ring	NBR-90 G25	2	2
27	O-ring	NBR-90 P8	4	4
28	O-ring	NBR-90 P11	3	2

Note) In the standard configuration, OGH-G04-P*-10 does not require a P plug, while OGH-G04-P*-B-10 requires a P plug (TPUA-1/16) and drain pipe from the cover.

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify G (internal drain) or GB (external drain) for the asterisk (*) in the kit model number.



01 Balanced Piston Type Pressure Reducing Modular Valve

40ℓ/min
0.15 to 25MPa

Features

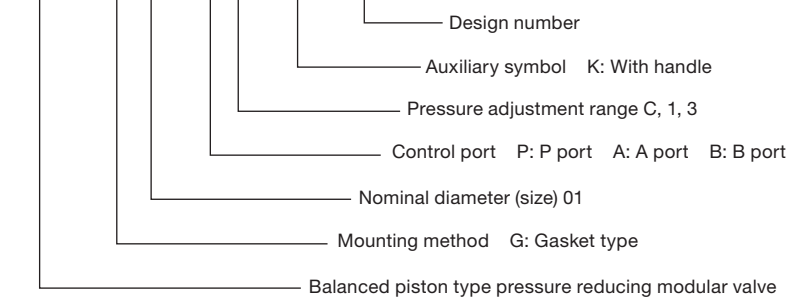
- ① This modular valve makes the pressure in part of the circuit lower than the main circuit.
- ② Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.
- ③ Compared with the direct type, this type of valve has outstanding Pressure-Flow Rate Characteristics, and a superior flow rate in the low pressure control range.
- ④ Maximum operating pressure: 25MPa {255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa(kgf/cm ²)	Weight kg	Gasket Surface Dimensions
OGB-G01-PC-20 P1 P3	1/8	25 {255}	40	0.15 to 3.5{ 1.5 to 35.7}	1.9	ISO 4401-03-02-0-05
0.8 to 7 { 8.2 to 71.4}						
3.5 to 21 {35.7 to 214}						
OGB-G01-AC-20 A1 A3				0.15 to 3.5{ 1.5 to 35.7}	1.9	
				0.8 to 7 { 8.2 to 71.4}		
				3.5 to 21 {35.7 to 214}		
OGB-G01-BC-20 B1 B3				0.15 to 3.5{ 1.5 to 35.7}	1.9	
				0.8 to 7 { 8.2 to 71.4}		
				3.5 to 21 {35.7 to 214}		

Explanation of model No.

OGB - G 01 - P 1 - (K) - 20



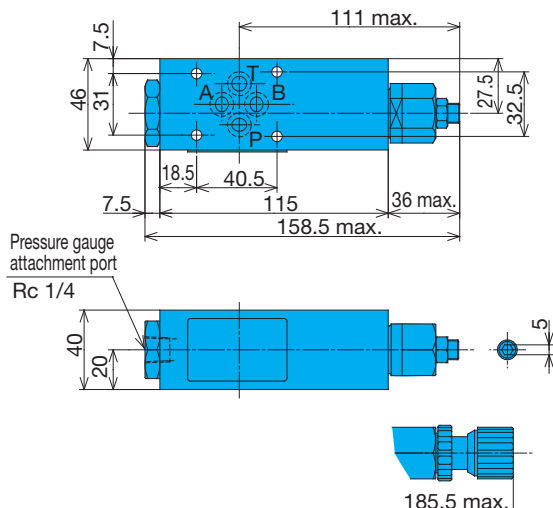
● Handling

- ① See the Pressure-Flow Rate Characteristics for information about how the flow rate is controlled at low pressures.
- ② Note that a change in tank port back pressure causes a change in setting pressure.
- ③ Vent piping is not possible.
- ④ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

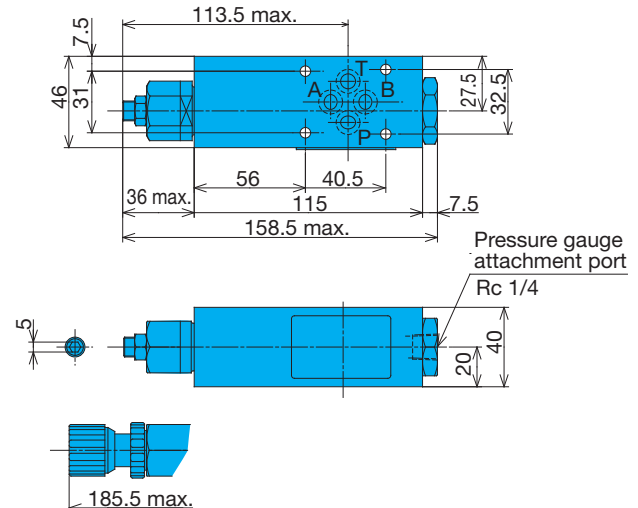
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OGB-G01-P^{*}-20
A



OGB-G01-B*-20

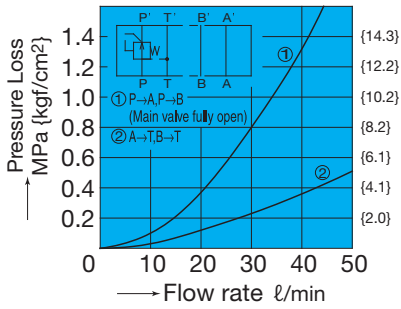


Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

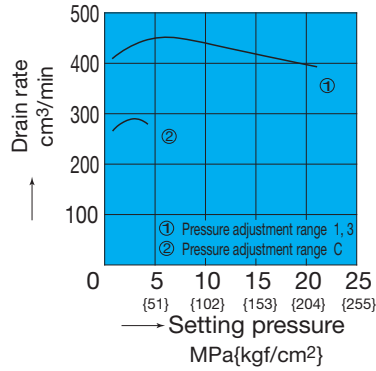
Pressure Loss Characteristics

OGB-G01-P*-20



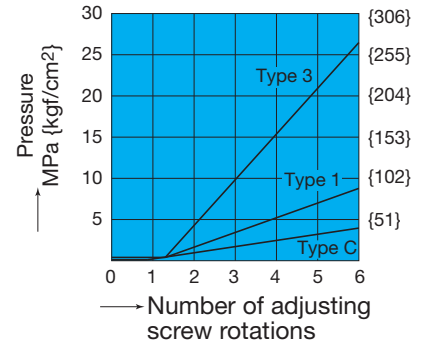
Pressure – Drain Rate Characteristics

OGB-G01-**-20



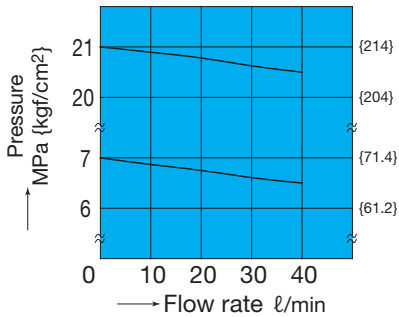
Number of Adjusting Screw Rotations – Pressure Characteristics

OGB-G01-P*-20

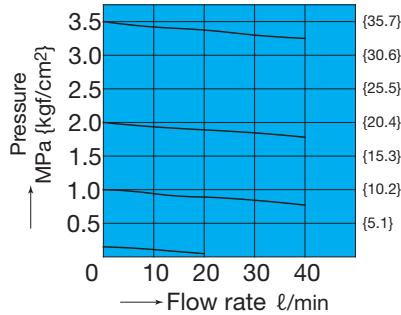


Pressure – Flow Rate Characteristics

OGB-G01-¹/₃-20

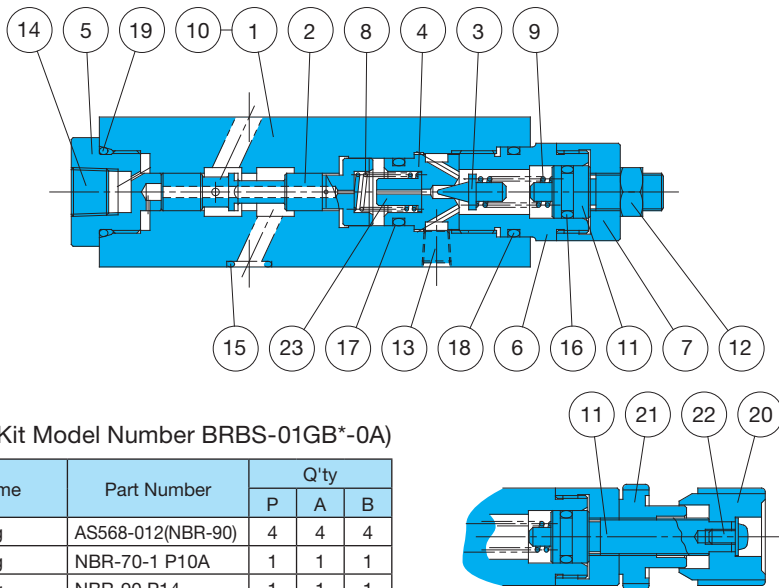


OGB-G01-*C-20



Cross-sectional Drawing

OGB-G01-P*-20



Part No.	Part Name
1	Body
2	Spool
3	Poppet
4	Seat
5	Bushing
6	Retainer
7	Bushing
8	Spring
9	Spring
10	Plate
11	Screw
12	Nut
13	Plug
14	Plug
15	O-ring
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	Knob
21	Nut
22	Screw
23	Choke

Seal Part List (Kit Model Number BRBS-01GB*-0A)

Part No.	Part Name	Part Number	Q'ty		
			P	A	B
15	O-ring	AS568-012(NBR-90)	4	4	4
16	O-ring	NBR-70-1 P10A	1	1	1
17	O-ring	NBR-90 P14	1	1	1
18	O-ring	NBR-90 P20	1	1	1
19	O-ring	NBR-90 P20	1	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify P, A, or B for the asterisk (*) in the kit model number.



Pressure Reducing Modular Valve

40 to 300ℓ/min
25,35MPa

Features

- ① This modular valve makes the pressure in part of the circuit lower than the main circuit.
- ② Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.
- ③ Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OG-G01-AC-21 A1 A2	1/8	25{255}	50	0.15 to 3.5{ 1.5 to 35.7}	1.3	ISO 4401-03-02-0-05
OG-G01-BC-21 B1 B2				0.8 to 7{ 8.2 to 71.4}		
OG-G03-AC-J51 A1 A3	3/8	25{255}	80 but C : 50	0.15 to 3.5{ 1.5 to 35.7}	1.3	
OG-G03-BC-J51 B1 B3				0.8 to 7{ 8.2 to 71.4}		
OGH-G04-A1-10 A3	1/2	35{357}	300	0.25 to 21{35.7 to 214}	3.8	ISO 4401-05-04-0-05
OGH-G04-B1-10 B3				0.25 to 3.5{ 2.5 to 35.7}		
OGH-G04-A1-10 A3	1/2	35{357}	300	0.8 to 7{ 8.2 to 71.4}	8.0	ISO 4401-07-06-0-05
OGH-G04-B1-10 B3				3.5 to 25{35.7 to 255}		
OGH-G04-A1-10 A3	1/2	35{357}	300	0.8 to 7{ 8.2 to 71.4}	8.0	ISO 4401-07-06-0-05
OGH-G04-B1-10 B3				3.5 to 25{35.7 to 255}		

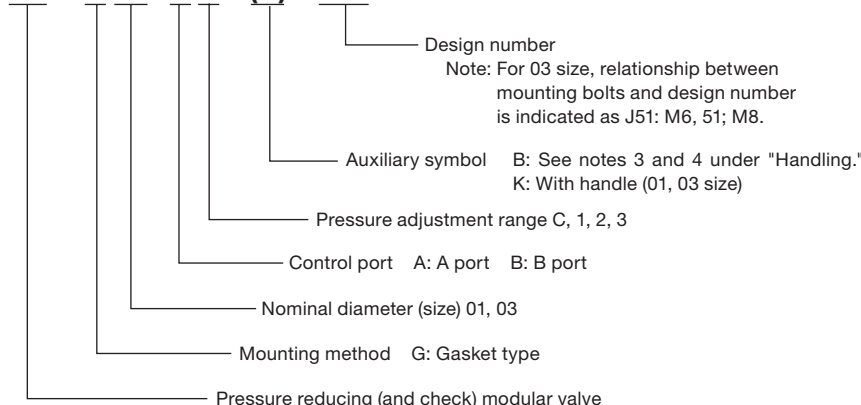
● Handling

- ① When using a remote control valve in a vent circuit, certain vent circuit pipe capacities can cause vibration. Because of this, thick steel pipe with an inside diameter of $\phi 4$ mm that is no longer than three meters is recommended. Vent piping cannot be used with the 01, 03 sizes.
- ② With the 01, 03 sizes, the flow rate is limited at low pressures. See the Pressure- Flow Rate Characteristics on page D-40 and D-41 for more information.
- ③ For the 03 size, the drainage can be allowed to escape through the T port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- ④ With the 04 sizes, piping is not required because drainage can be allowed to escape from the gasket side drain port. In the case of a valve with the auxiliary symbol B, however, run a return pipe from the drain discharge port directly to the tank.
- ⑤ Note that a change in drain back pressure causes a change in setting pressure.
- ⑥ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑦ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- ⑧ With the 03, 04 sizes, the control port can be changed by altering the attachment orientation of the back cover. See the installation diagram for more information. After making this change, be sure also to make the other changes as in accordance with the model number indicated on the nameplate.
- ⑨ Use the P port control valve concurrently with the 01 size central all-port-block (C5) solenoid valve if when the valve is in the central position and external pressure may cause the pressure at the control port to exceed the set pressure.

Explanation of model No.

01, 03 size

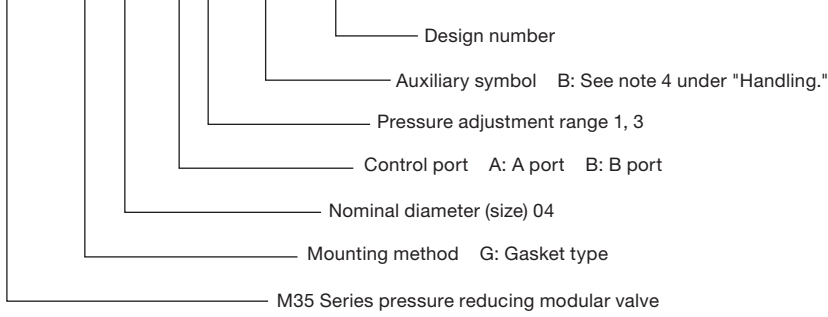
OG - G 03 - B 1 - (B) - J51



Explanation of model No.

04 size

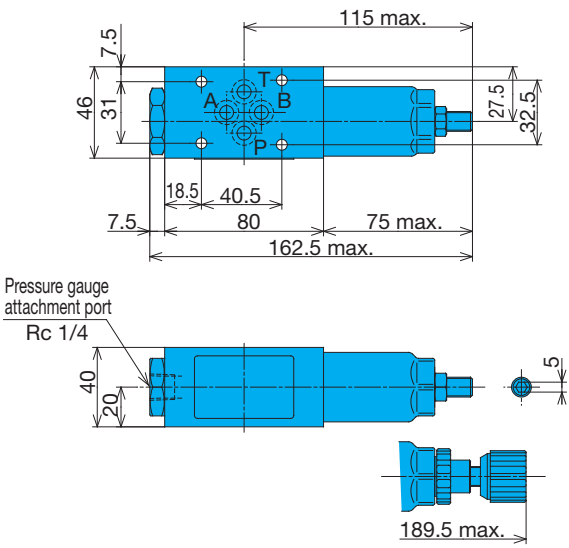
OGH - G 04 - A 1 - (B) - 10



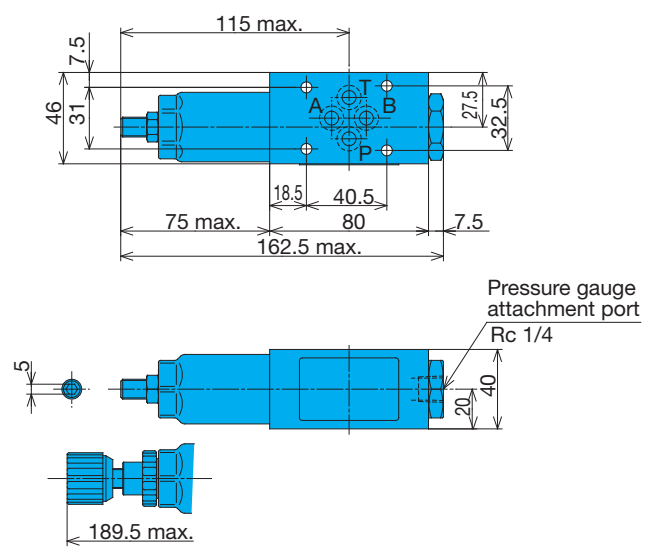
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

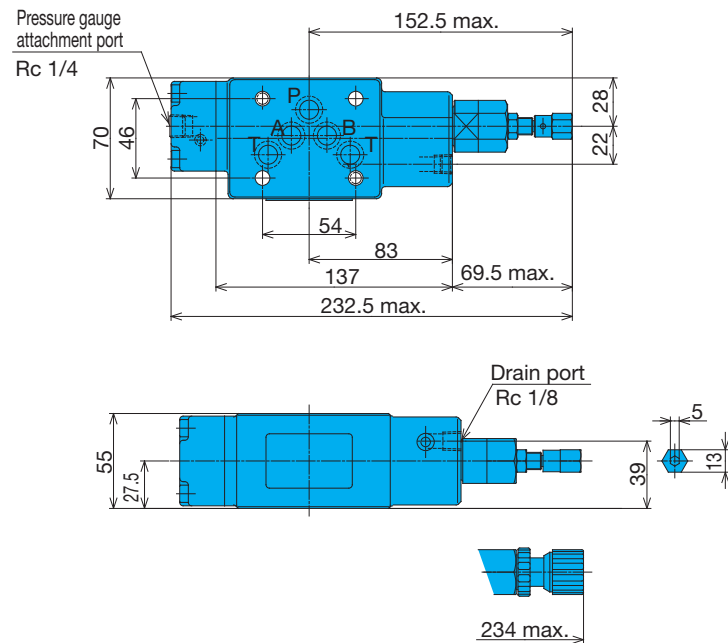
OG-G01-A*-21



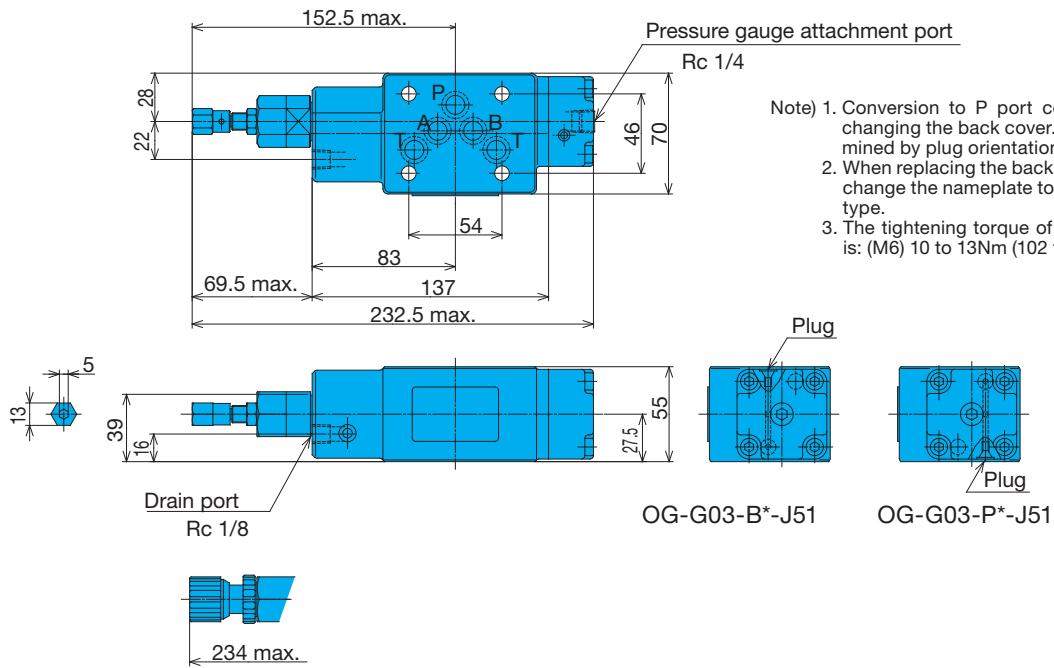
OG-G01-B*-21



OG-G03-A*-J51



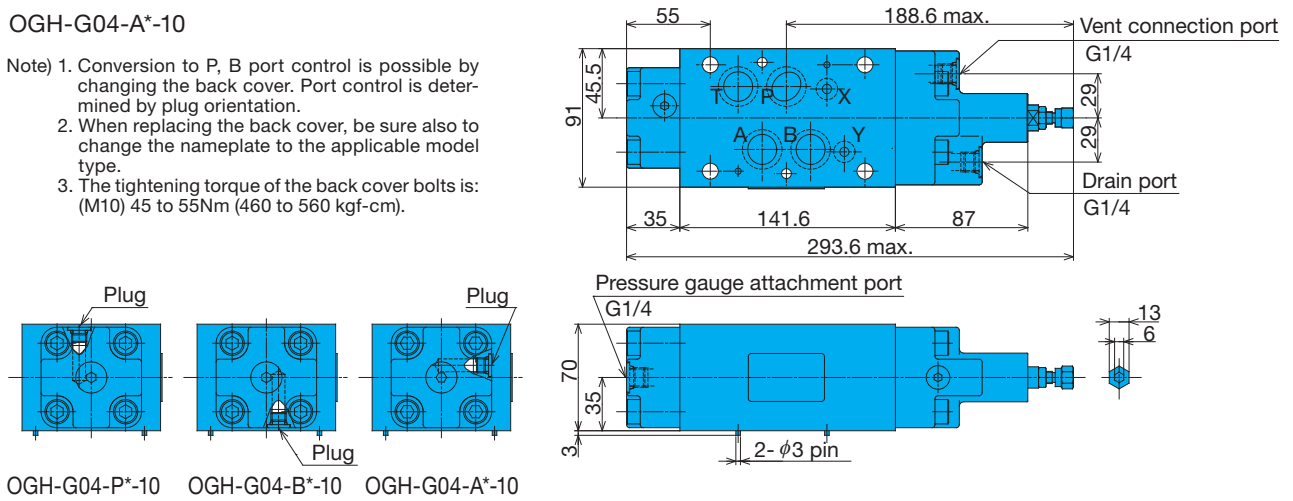
OG-G03-B*-J51



- Note) 1. Conversion to P port control is possible by changing the back cover. Port control is determined by plug orientation.
 2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
 3. The tightening torque of the back cover bolts is: (M6) 10 to 13Nm (102 to 133 kgf-cm).

OGH-G04-A*-10

- Note) 1. Conversion to P, B port control is possible by changing the back cover. Port control is determined by plug orientation.
 2. When replacing the back cover, be sure also to change the nameplate to the applicable model type.
 3. The tightening torque of the back cover bolts is: (M10) 45 to 55Nm (460 to 560 kgf-cm).



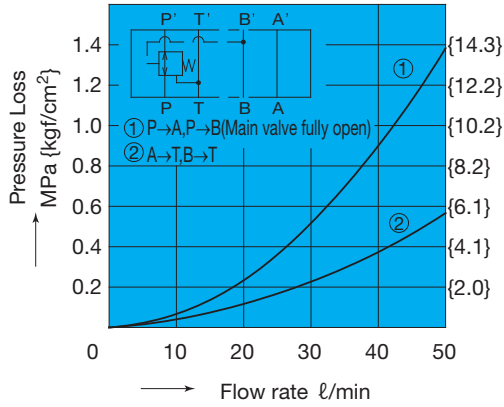
OGH-G04-P*-10 OGH-G04-B*-10 OGH-G04-A*-10

Performance Curves

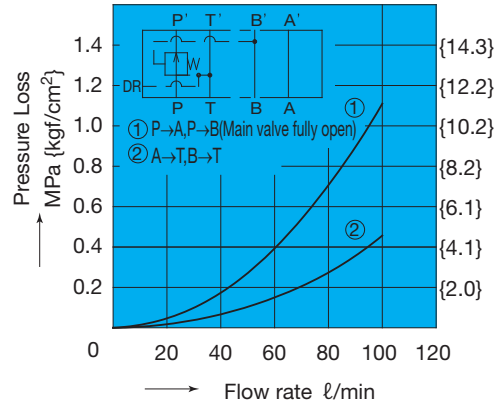
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Curve

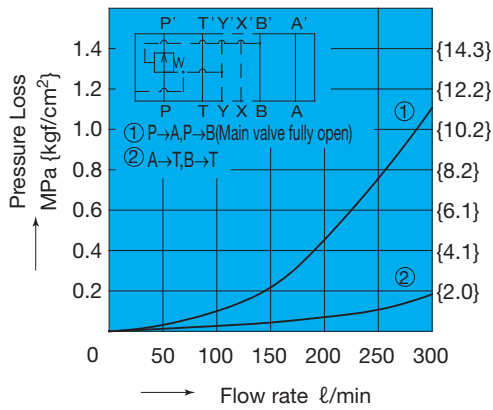
OG-G01-B*-21



OG-G03-B*-J51

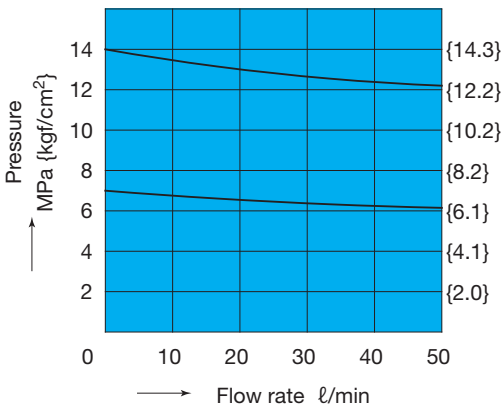


OGH-G04-**-10

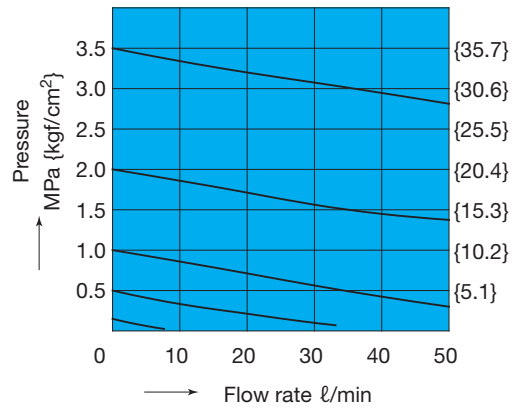


Pressure – Flow Rate Characteristics

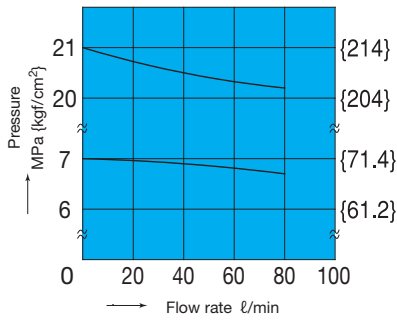
OG-G01-B₂¹-21



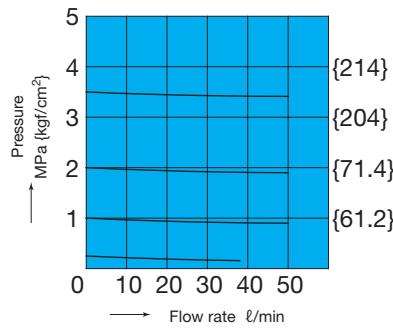
OG-G01-BC-21



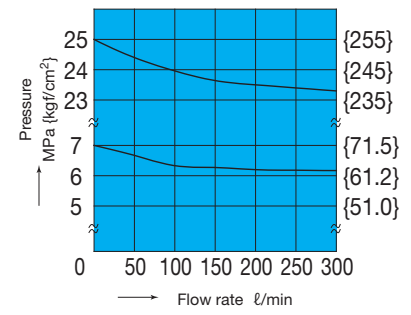
OG-G03-B₃¹-J51



OG-G03-BC-J51

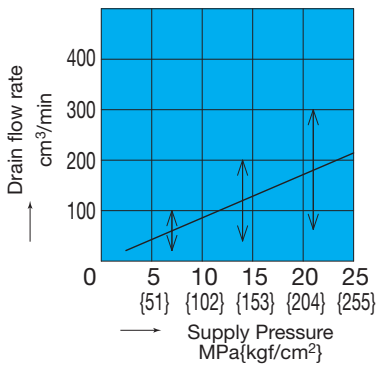


OGH-G04-**-10

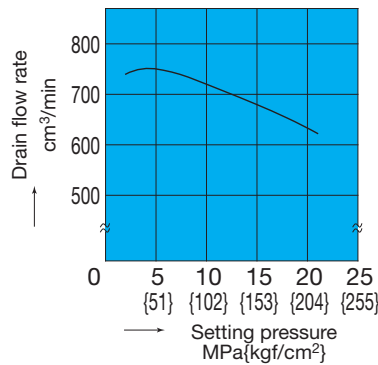


Pressure – Drain Rate Characteristics

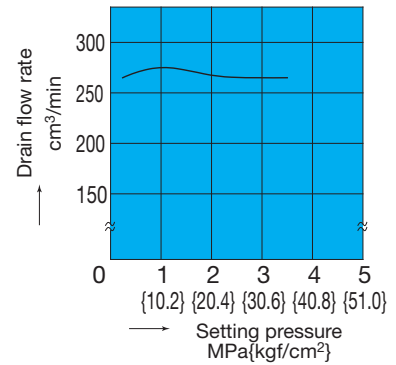
OG-G01-B*-21



OG-G03-B*-J51

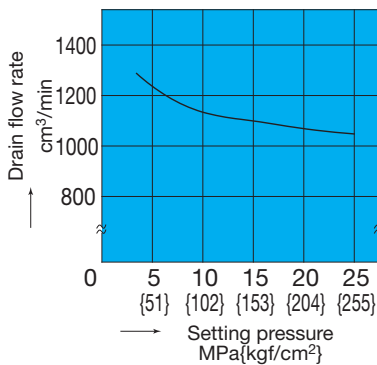


OG-G03-BC-J51



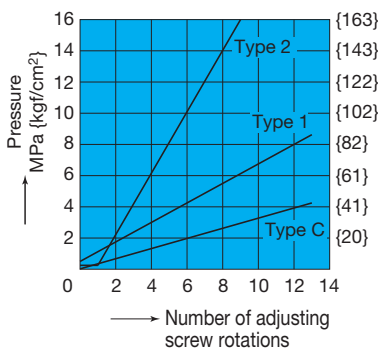
Determine it through the maximum value when designing the circuit.

OGH-G04-*3-10

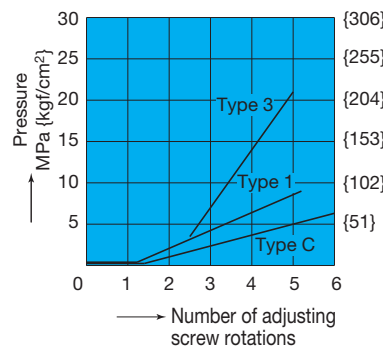


Number of Adjusting Screw Rotations – Pressure Characteristics

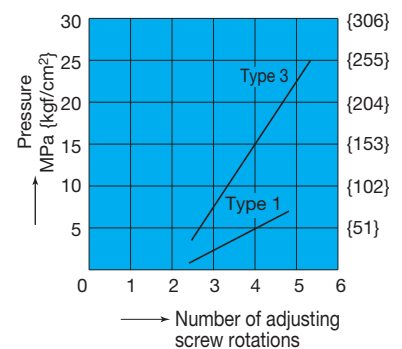
OG-G01-**-21



OG-G03-**-51

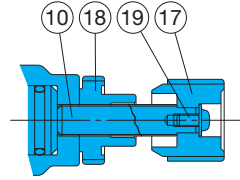
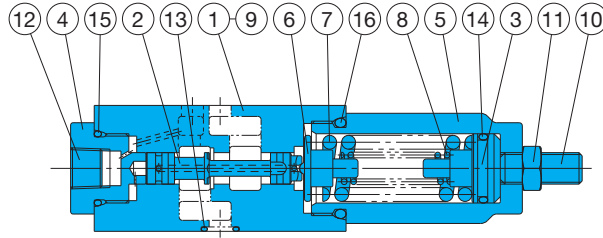


OGH-G04-**-10



Cross-sectional Drawings

OG-G01-A2-21



Part No.	Part Name
1	Body
2	Spool
3	Push rod
4	Bushing
5	Retainer
6	Guide
7	Spring
8	Spring
9	Plate
10	Screw
11	Nut
12	Plug
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Knob
18	Nut
19	Screw

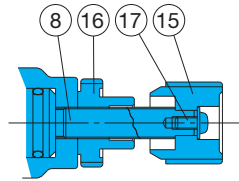
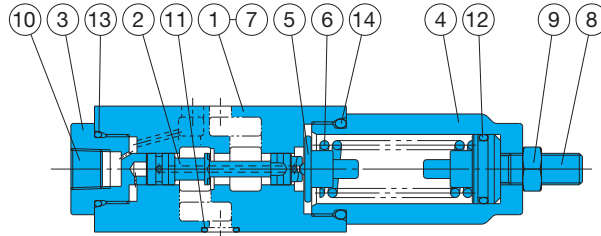
Seal Part List (Kit Model Number BRBS-01GP-0A)

Part No.	Part Name	Part Number	Q'ty
13	O-ring	AS568-012(NBR-90)	4
14	O-ring	NBR-70-1 P18	1
15	O-ring	NBR-90 P20	1
16	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Note) Part number 8 is used in the case of pressure adjustment range type 2 only.

OG-G01-AC-21



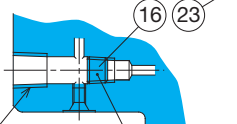
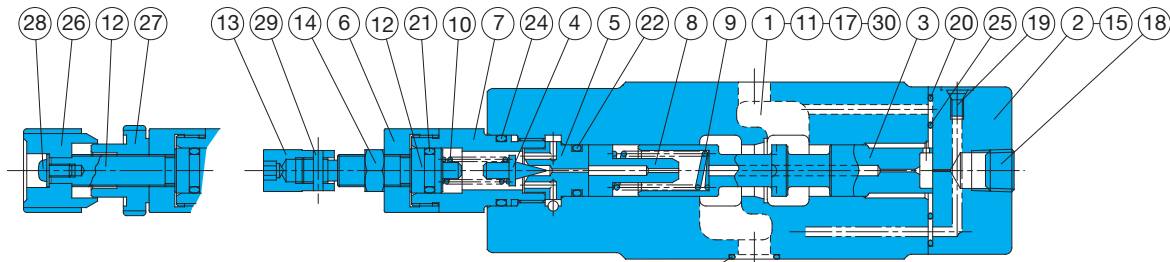
Part No.	Part Name
1	Body
2	Spool
3	Bushing
4	Retainer
5	Guide
6	Spring
7	Plate
8	Screw
9	Nut
10	Plug
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Knob
16	Nut
17	Screw

Seal Part List (Kit Model Number BRBS-01GP-0A)

Part No.	Part Name	Part Number	Q'ty
11	O-ring	AS568-012(NBR-90)	4
12	O-ring	NBR-70-1 P18	1
13	O-ring	NBR-90 P20	1
14	O-ring	NBR-90 P26	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OG-G03-B*-J51



Drain port
Rc1/8

"P" plug

Note) The discharge port of the OG-G03-**-J51 has the plug (TPHA-1/8), the "P" plug (TPUA-1/16) is not attached. The OG-G03-**-B-J51 does not have a plug in the drain discharge port with the "P" plug attached, so pipe must be run from the drain discharge port to provide drainage.

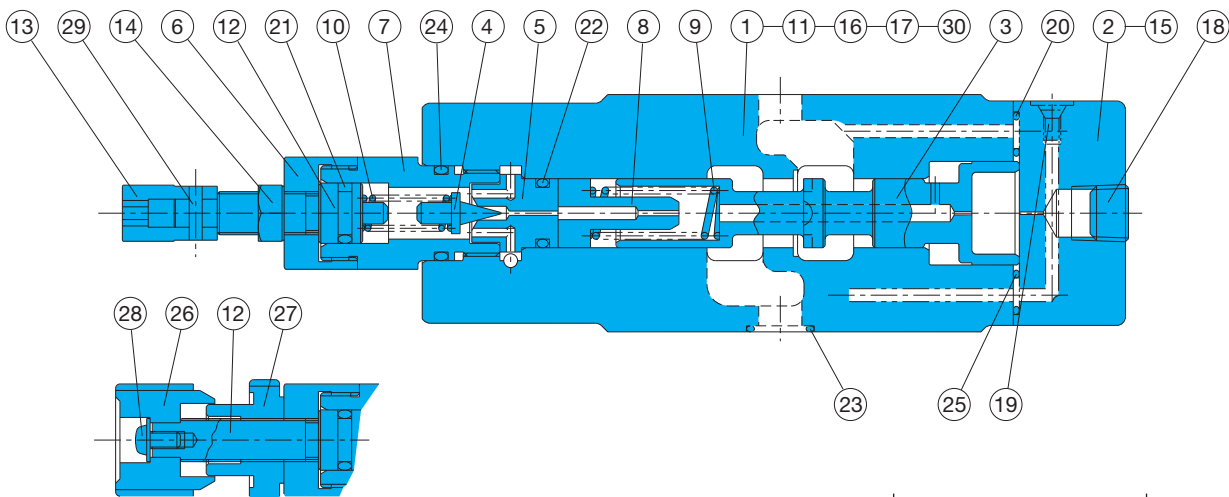
Seal Part List (Kit Model Number BRES-03G*-1A)

Part No.	Part Name	Part Number	Q'ty	
			A	B
20	O-ring	NBR-90 P6	2	2
21	O-ring	NBR-70-1 P10A	1	1
22	O-ring	NBR-90 P12	1	1
23	O-ring	AS568-014(NBR-90)	5	5
24	O-ring	NBR-90 P18	1	1
25	O-ring	AS568-023(NBR-90)	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify A or B for the asterisk (*) in the kit model number.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	11	Plate	21	O-ring
2	Cover	12	Screw	22	O-ring
3	Spool	13	Nut	23	O-ring
4	Poppet	14	Nut	24	O-ring
5	Seat	15	Screw	25	O-ring
6	Bushing	16	Plug	26	Knob
7	Retainer	17	Plug	27	Nut
8	Choke	18	Plug	28	Screw
9	Spring	19	Plug	29	Pin
10	Spring	20	O-ring	30	Pin

OG-G03-BC-J51



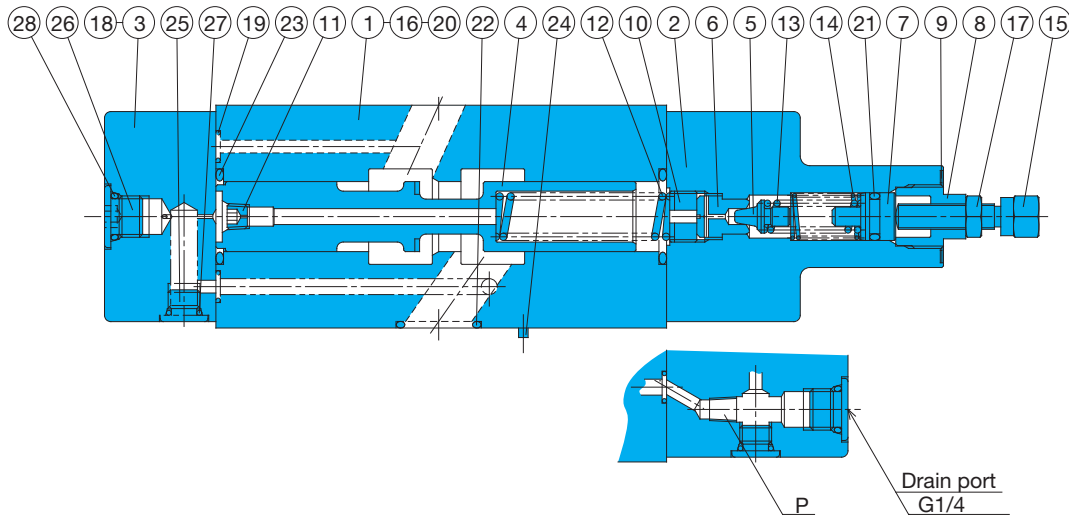
Seal Part List (Kit Model Number BRES-03GC*-1A)

Part No.	Part Name	Part Number	Q'ty	
			A	B
20	O-ring	NBR-90 P6	2	2
21	O-ring	NBR-70-1 P10A	1	1
22	O-ring	NBR-90 P12	1	1
23	O-ring	AS568-014(NBR-90)	5	5
24	O-ring	NBR-90 P18	1	1
25	O-ring	AS568-023(NBR-90)	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify A or B for the asterisk (*) in the kit model number.

Part No.	Part Name	Part No.	Part Name
1	Body	16	Plug
2	Cover	17	Plug
3	Spool	18	Plug
4	Poppet	19	Plug
5	Seat	20	O-ring
6	Bushing	21	O-ring
7	Retainer	22	O-ring
8	Choke	23	O-ring
9	Spring	24	O-ring
10	Spring	25	O-ring
11	Plate	26	Knob
12	Screw	27	Nut
13	Nut	28	Screw
14	Nut	29	Pin
15	Screw	30	Pin

OGH-G04-**-10



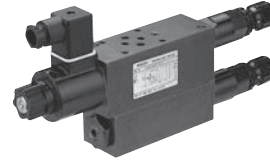
Seal Part List (Kit Model Number BRKS-04**)

Part No.	Part Name	Part Number	Q'ty	
			G	GB
19	O-ring	NBR-90 P7	4	4
20	O-ring	AS568-012(NBR-90)	2	2
21	O-ring	NBR-70-1 P11	1	1
22	O-ring	AS568-118(NBR-90)	4	4
23	O-ring	NBR-90 G25	2	2
27	O-ring	NBR-90 P8	4	4
28	O-ring	NBR-90 P11	3	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify G (internal drain) or GB (external drain) for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Spool
5	Poppet
6	Seat
7	Plunger
8	Retainer
9	Plate
10	Collar
11	Choke
12	Spring
13	Spring
14	Spring
15	Screw
16	Plate
17	Nut
18	Screw
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	Pin
25	Plug
26	Plug
27	O-ring
28	O-ring

Note) In the standard configuration, OGH-G04-**-10 does not require a P plug, while OGH-G04-**-B-10 requires a P plug (TPUA-1/16) and drain pipe from the cover.



Two-Pressure Reducing Modular Valve

40ℓ/min
0.2 to 14MPa

Features

- ① When the pressure in part of the circuit is lower than the main circuit, this modular valve controls pressure by switching the low pressure to secondary pressure (high pressure, low pressure).
- ② Even when pressure changes in the primary main circuit, the reduced secondary pressure is maintained at a constant level.
- ③ Maximum Operating Pressure: 7, 25MPa {71.4, 255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }		Weight kg	Gasket Surface Dimensions
				Low pressure side	High pressure side		
OGS-G01-PCC-K-**-22 P1C	1/8	7{71.4}	40	0.2 to 3.5 {2.0 to 35.7}	0.2 to 3.5{ 2.0 to 35.7} 0.8 to 7{ 8.2 to 71.4}	4.8	ISO 4401-03-02-0-05
P21		25{255}		0.8 to 7 {8.2 to 71.4}	3.5 to 14{35.7 to 143}		

Solenoid Specifications

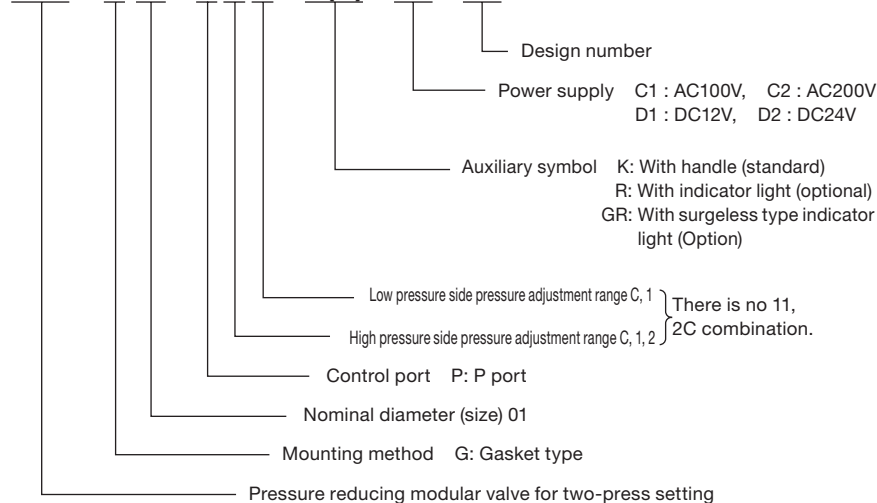
Model No.	Rated Voltage	Starting Current	Holding Current	Holding Power
OGS-G01-P**-K- C1-22	AC100V 50/60HZ	2.2/2.0A	0.52/0.38A	25/22W
C2	AC200V 50/60HZ	1.1/1.0A	0.26/0.19A	25/22W
D1	DC12V		2.2A	26W
D2	DC24V		1.1A	26W

● Handling

- ① See the Pressure-Flow Rate Characteristics for information about how the flow rate is controlled at low pressures.
- ② Note that a change in tank port back pressure causes a change in setting pressure.
- ③ Instability occurs when there is a small setting pressure differential between the high pressure and low pressure, so be sure to maintain at least the minimum pressure differentials described below.
C Type:
At least 0.3MPa {3.1 kgf/cm²}
1, 2 Type:
At least 0.5MPa {5.1 kgf/cm²}
- ④ Vent piping is not possible.
- ⑤ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑥ Low pressure is attained when the solenoid is on.
- ⑦ The coil surface temperature increases if this pump is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
- ⑧ The wiring in the connector is the same as the SA series wet type solenoid valve. (See page E-19)

Explanation of model No.

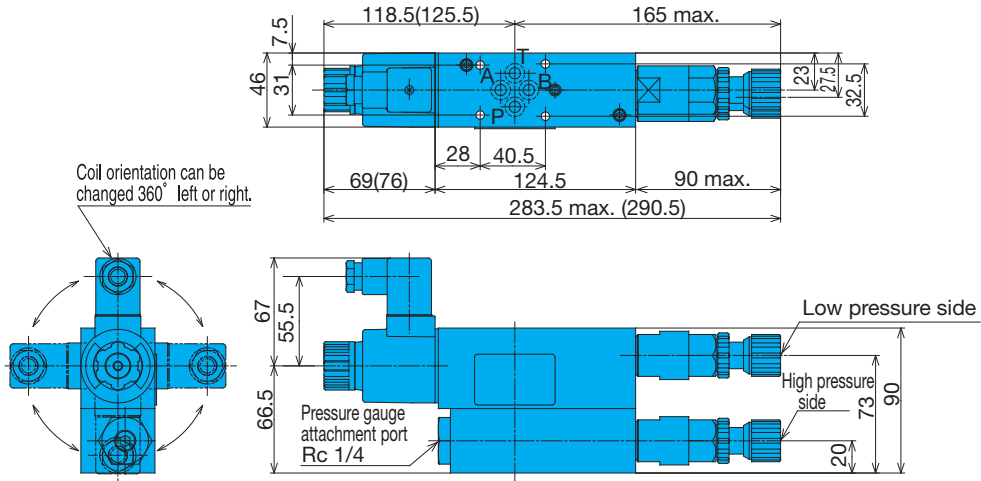
OGS - G 01 - P 1 C - K(R) - C1 - 22



Installation Dimension Drawings

Note) 1. Dimensions in parentheses apply in the case of a DC solenoid.
 2. Pressure is increased by clockwise (rightward) rotation of the adjusting handle, and decreased by counterclockwise (leftward) rotation

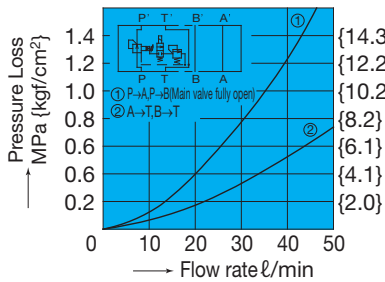
OGS-G01-P*C-K(R)-**-22



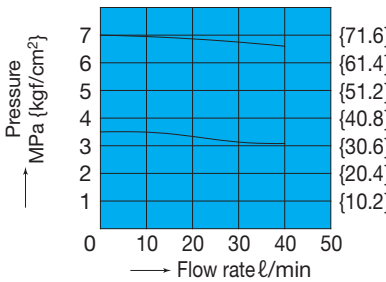
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

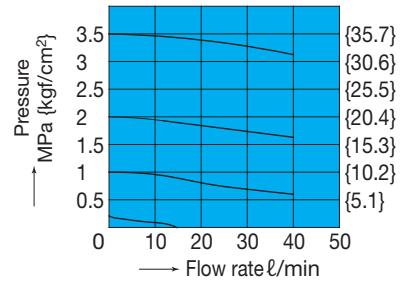
Pressure Loss Characteristics
OGS-G01-PIC-K**-22



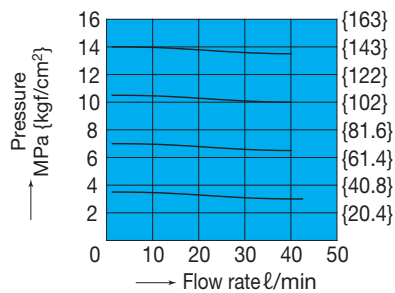
Pressure – Flow Rate Characteristics
OGS-G01-PIC-K**-22
(Type 1)



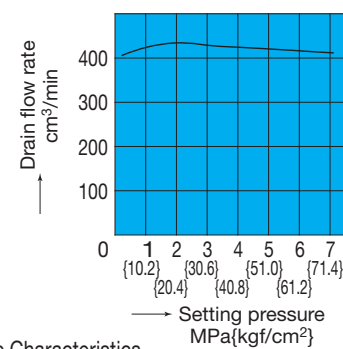
OGS-G01-P*C-K**-22
(Type C)



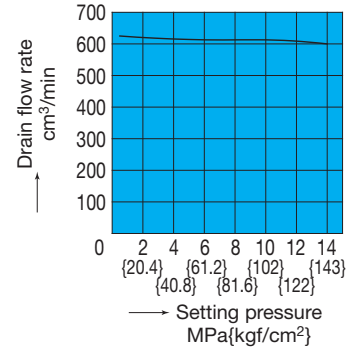
Pressure – Flow Rate Characteristics
OGS-G01-P21-K**-22
(Type 2)



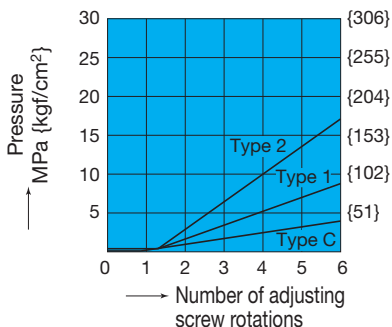
Pressure – Drain Rate Characteristics
OGS-G01-PIC-K**-22



Pressure – Drain Rate Characteristics
OGS-G01-P21-K**-22

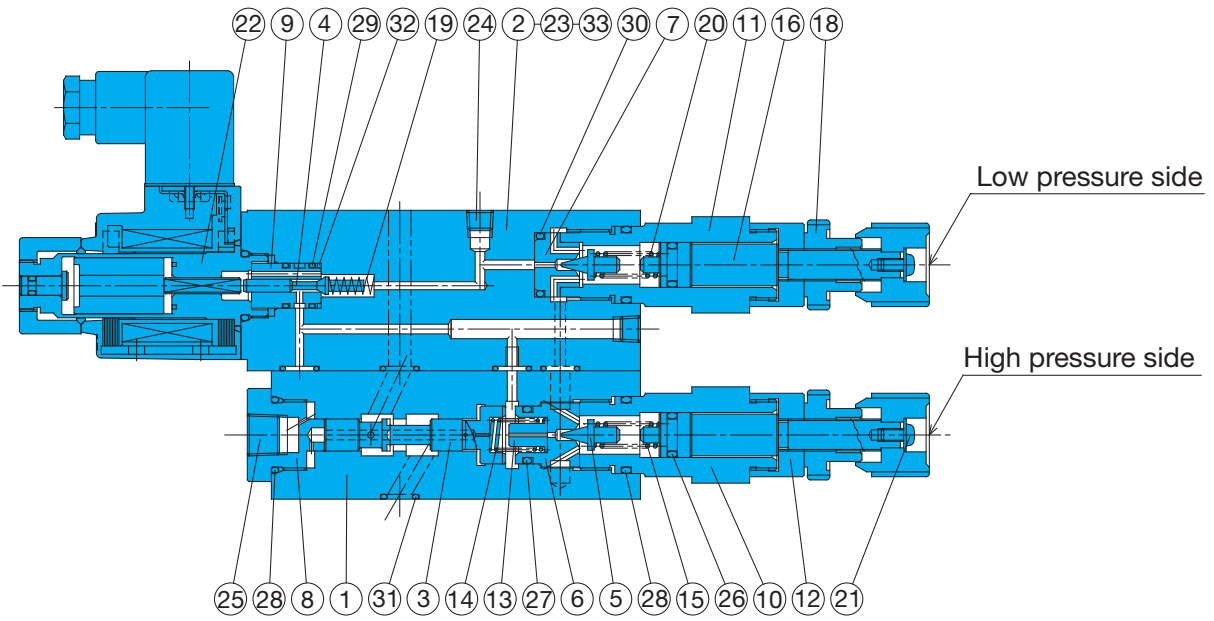


Number of Adjusting Screw Rotations – Pressure Characteristics
OGS-G01-P**-22



Cross-sectional Drawing

OGS-G01-P*C-K(R)-**1-22



Seal Part List (Kit Model Number BRBS-01GSP-1B)

Part No.	Part Name	Part Number	Q'ty
26	O-ring	NBR-70-1 P10A	2
27	O-ring	NBR-90 P14	1
28	O-ring	NBR-90 P20	3
29	O-ring	AS568-013(NBR-90)	2
30	O-ring	NBR-90 P16	1
31	O-ring	AS568-012(NBR-90)	11
32	Backup ring	For AS568-013	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name	Part No.	Part Name
1	Body	18	Nut
2	Body	19	Spring
3	Spool	20	Spring
4	Spool	21	Screw
5	Poppet	22	Solenoid assy
6	Seat	23	Screw
7	Seat	24	Plug
8	Bushing	25	Plug
9	Sleeve	26	O-ring
10	Retainer	27	O-ring
11	Retainer	28	O-ring
12	Bushing	29	O-ring
13	Choke	30	O-ring
14	Spring	31	O-ring
15	Spring	32	Backup ring
16	Screw	33	Plate
17	Knob		

Sequence Modular Valve

40 to 80ℓ/min
25MPa



Features

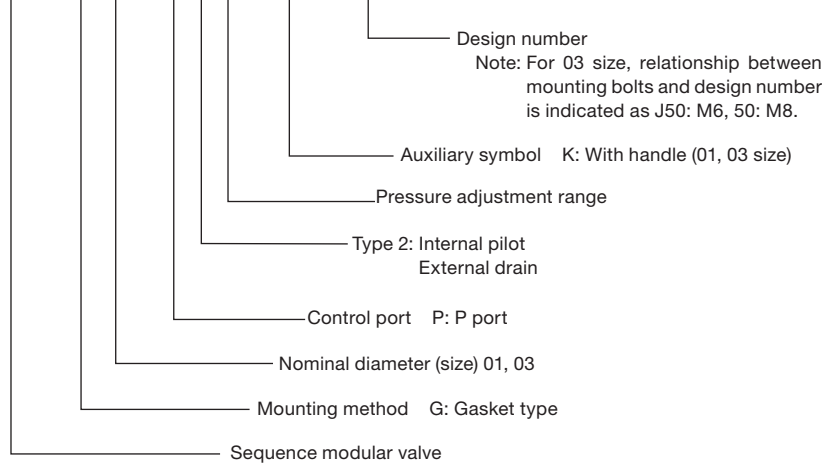
- ① This modular valve is a pressure control valve used for sequential actuator operations and for maintaining main circuit pressure.
- ② Pressure adjustment is possible across a wide range, from 0.25 to 21MPa {2.5 to 214 kgf/cm²}.
- ③ Maximum Operating Pressure: 25MPa {255kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa(kgf/cm ²)	Weight kg	Gasket Surface Dimensions
OQ-G01-P21-20 P23	1/8	25{255}	40	0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214}	1.1	ISO 4401-03-02-0-05
OQ-G03-P2A-J50 P2C P2E	3/8	25{255}	80	0.25 to 0.85 { 2.5 to 8.7 } 0.85 to 3.5 { 8.7 to 35.7 } 3.5 to 14 {35.7 to 143}	3.5	ISO 4401-05-04-0-05

Explanation of model No.

OQ - G 03 - P 2 A - (K) - J50



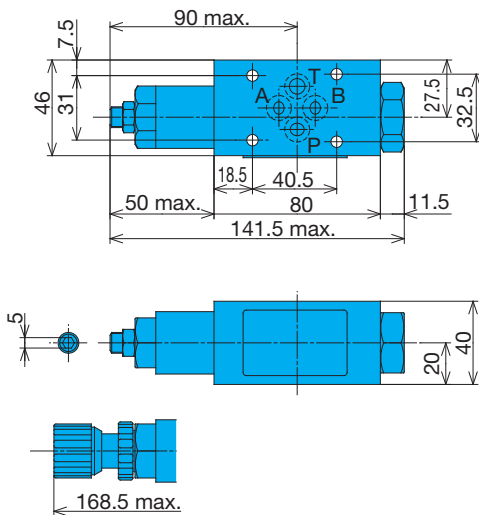
● Handling

- ① The pressure adjustment range is expressed in terms of cracking pressure.
- ② Install this valve directly above the sub plate or manifold.
- ③ When two or more of these valves are ganged in sequence, make sure the setting pressure differential between them is at least 1MPa {10.2kgf/cm²}.
- ④ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

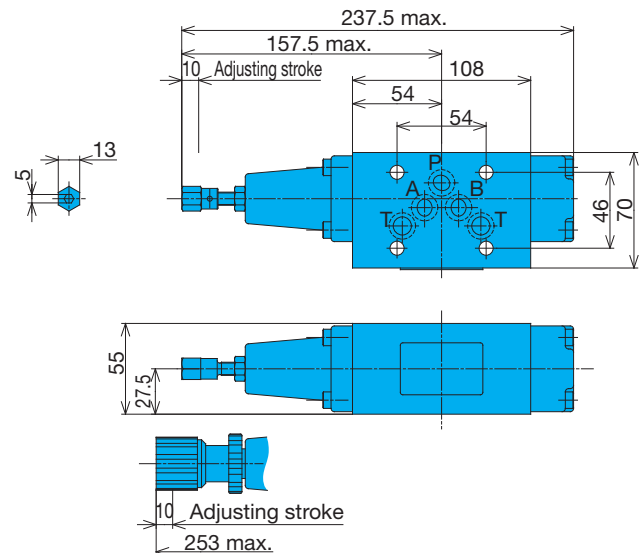
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

OQ-G01-P2*-20



OQ-G03-P2*-J50

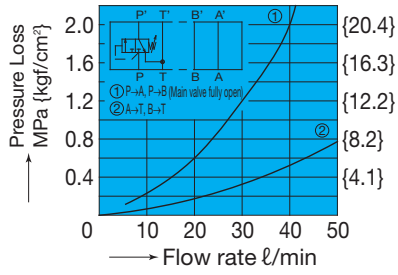


Performance Curves

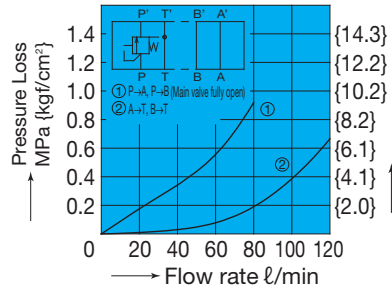
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

OQ-G01-P2*-20



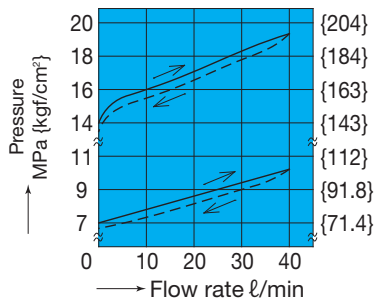
OQ-G03-P2A-J50



Pressure – Flow Rate Characteristics

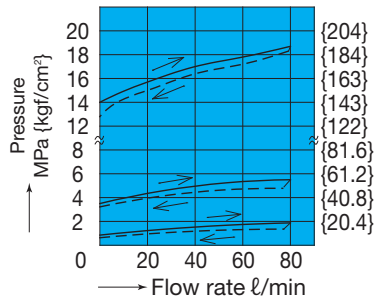
OQ-G01-P2*-20

— Pressure Rise
- - - Pressure Drop



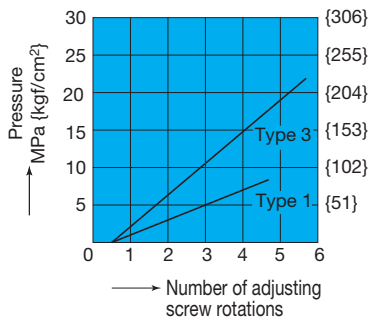
OQ-G03-P2*-J50

— Pressure Rise
- - - Pressure Drop

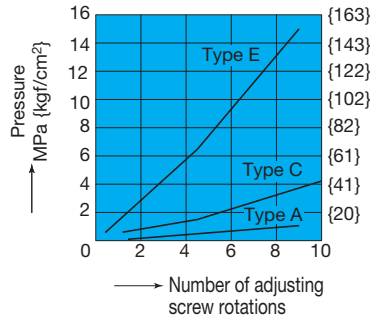


Number of Adjusting Screw Rotations – Pressure Characteristics

OQ-G01-P2*-20

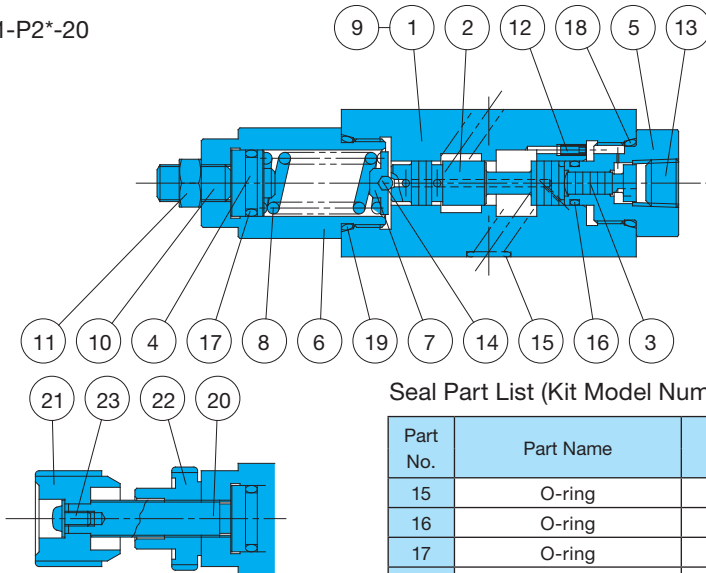


OQ-G03-P2*-J50



Cross-sectional Drawings

OQ-G01-P2*-20



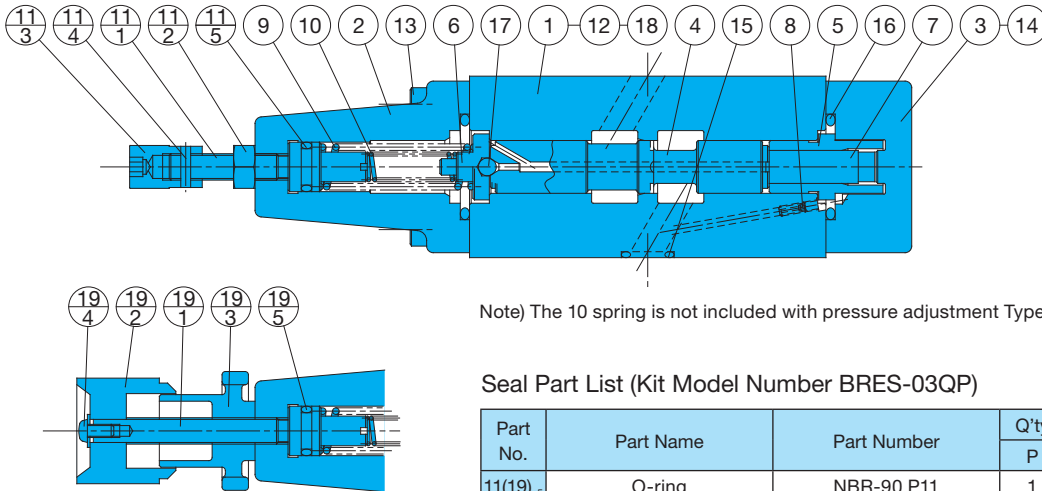
Seal Part List (Kit Model Number BRBS-01QP-0A)

Part No.	Part Name	Part Number	Q'ty	
			P	
15	O-ring	AS568-012(NBR-90)	4	
16	O-ring	NBR-90 P9	1	
17	O-ring	NBR-70-1 P14	1	
18	O-ring	NBR-90 P20	1	
19	O-ring	NBR-90 P22	1	

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Spool
3	Piston
4	Plunger
5	Bushing
6	Retainer
7	Guide
8	Spring
9	Plate
10	Screw
11	Nut
12	Choke
13	Plug
14	Ball
15	O-ring
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	Screw
21	Knob
22	Nut
23	Screw

OQ-G03-P2*-J50



Note) The 10 spring is not included with pressure adjustment Type A.

Seal Part List (Kit Model Number BRES-03QP)

Part No.	Part Name	Part Number	Q'ty	
			P	
11(19) _{.5}	O-ring	NBR-90 P11	1	
15	O-ring	AS568-014(NBR-90)	5	
16	O-ring	NBR-90 P26	2	

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Spool
5	Sleeve
6	Guide
7	Plunger
8	Choke
9	Spring
10	Spring
11	Screw kit
11.1	Screw
11.2	Nut
11.3	Nut
11.4	Pin
11.5	O-ring
12	Plate
13	Screw
14	Screw
15	O-ring
16	O-ring
17	Ball
18	Pin
19	Handle kit
19.1	Screw
19.2	Knob
19.3	Nut
19.4	Screw
19.5	O-ring



Counter Balance Modular Valve

40 to 300ℓ/min
14MPa

Features

- ① This modular valve is used to control actuator back pressure and for other pressure control valve applications.
- ② Pressure adjustment is possible across a wide range, from 0.25 to 14MPa {2.5 to 143kgf/cm²}.
- ③ Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OCQ-G01-A11-20 A12	1/8	25{255}	40	0.8 to 7{ 8.2 to 71.4}	1.1	ISO 4401-03-02-0-05
OCQ-G01-B11-20 B12				3.5 to 14{35.7 to 143}		
OCQ-G03-A1A-J50 A1C A1E	3/8	25{255}	80	0.25 to 0.85{ 2.5 to 8.7}	3.5	ISO 4401-05-04-0-05
OCQ-G03-B1A-J50 B1C B1E				0.85 to 3.5{ 8.7 to 35.7}		
OQH-G04-A1A-10 A1C A1E	1/2	35{357}	300	0.25 to 0.85{ 2.5 to 8.7}	8.0	ISO 4401-07-06-0-05
OQH-G04-B1A-10 B1C B1E				0.5 to 3.5{ 5.1 to 35.7}		
				2.0 to 14{20.4 to 143}	8.0	

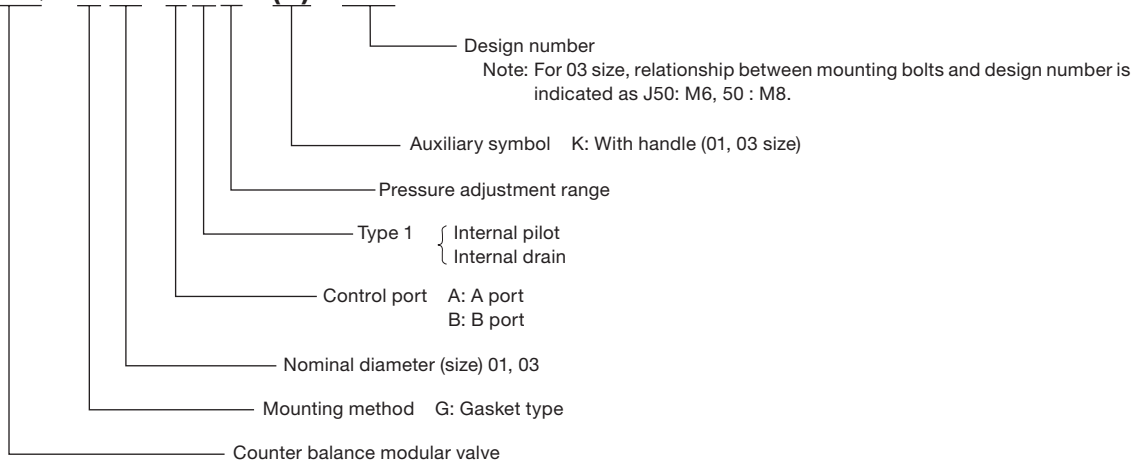
● Handling

- ① The pressure adjustment range is expressed in terms of cracking pressure.
- ② Run tank port piping directly to the tank, and ensure that back pressure is as small as possible.
- ③ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ④ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

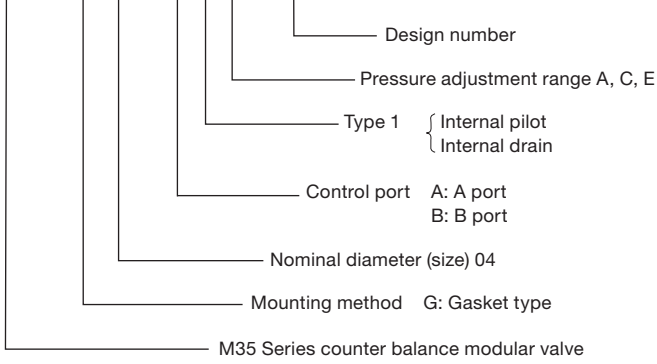
OCQ - G 03 - B 1 A - (K) - J50



Explanation of model No.

04 size

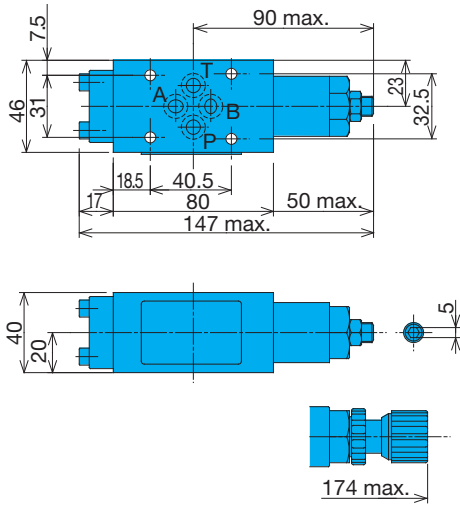
OQH - G 04 - B 1 A - 10



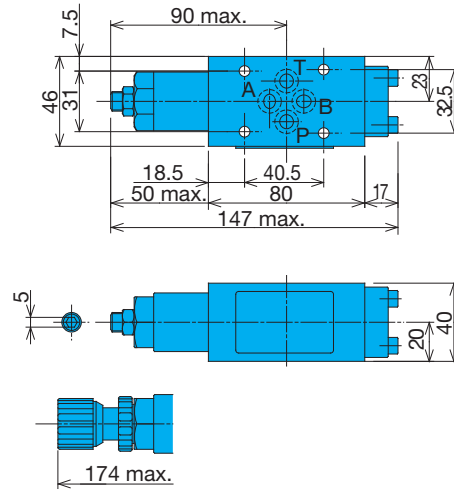
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw (bolt), and decreased by counterclockwise (leftward) rotation.

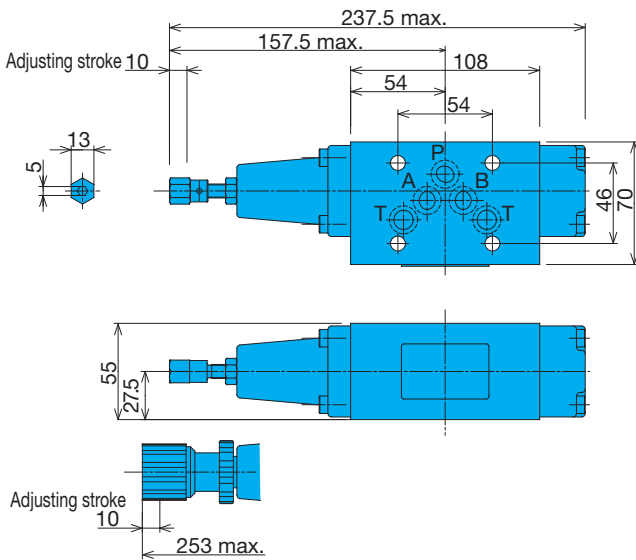
OCQ-G01-A1*-20



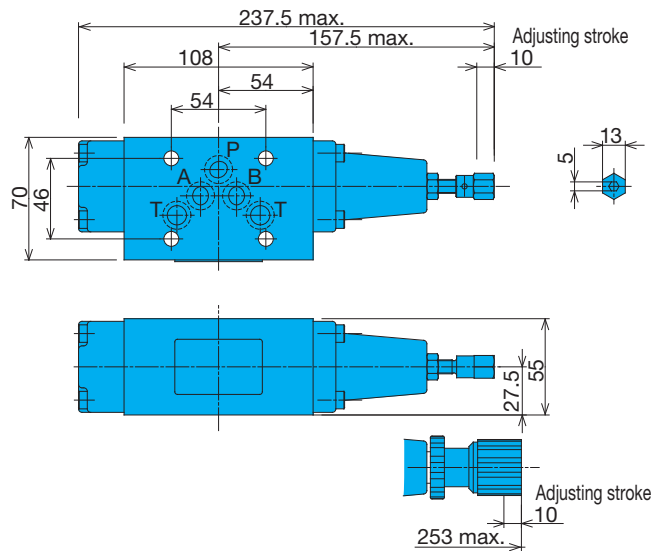
OCQ-G01-B1*-20



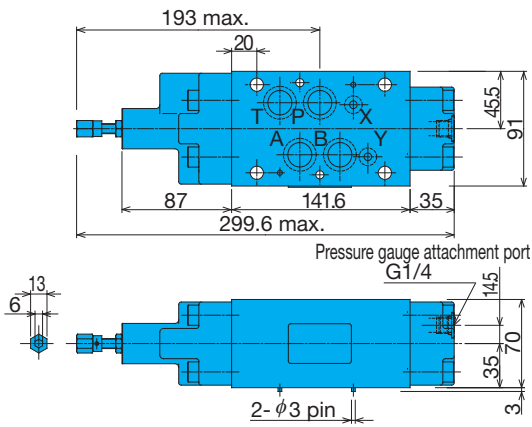
OCQ-G03-A1*-J50



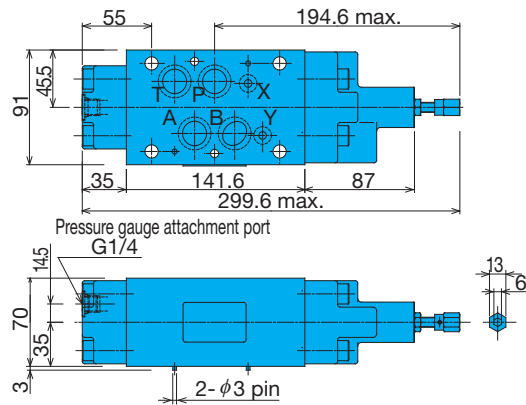
OCQ-G03-B1*-J50



OQH-G04-A1*-10



OQH-G04-B1*-10

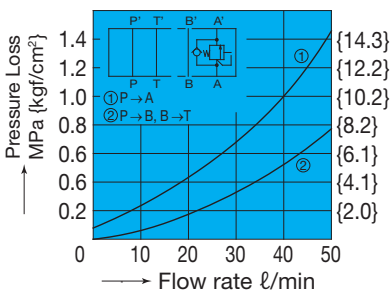


Performance Curves

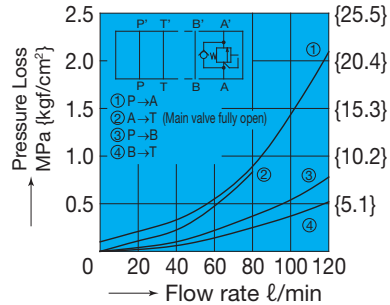
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

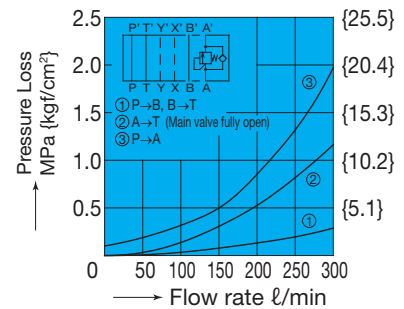
OCQ-G01-A1*-20



OCQ-G03-A1A-J50

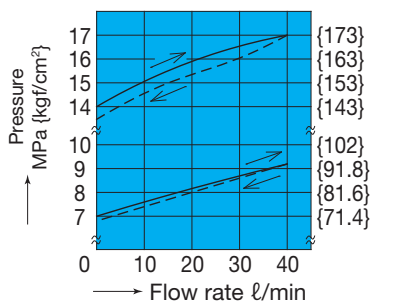


OQH-G04-A1A-10

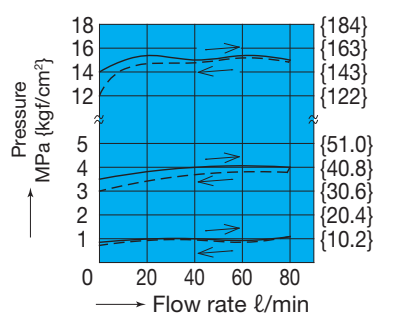


Pressure - Flow Rate Characteristics

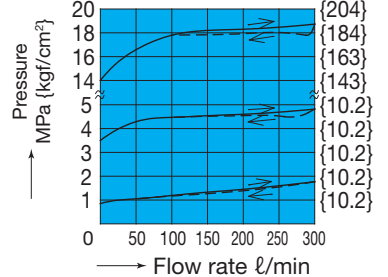
OCQ-G01-A1*-20



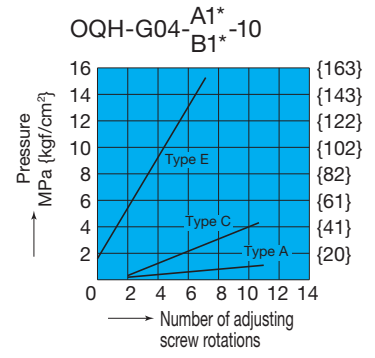
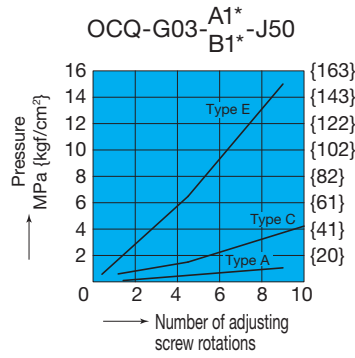
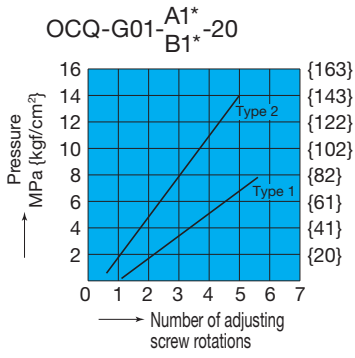
OCQ-G03-A1*-J50



OQH-G04-A1*-10

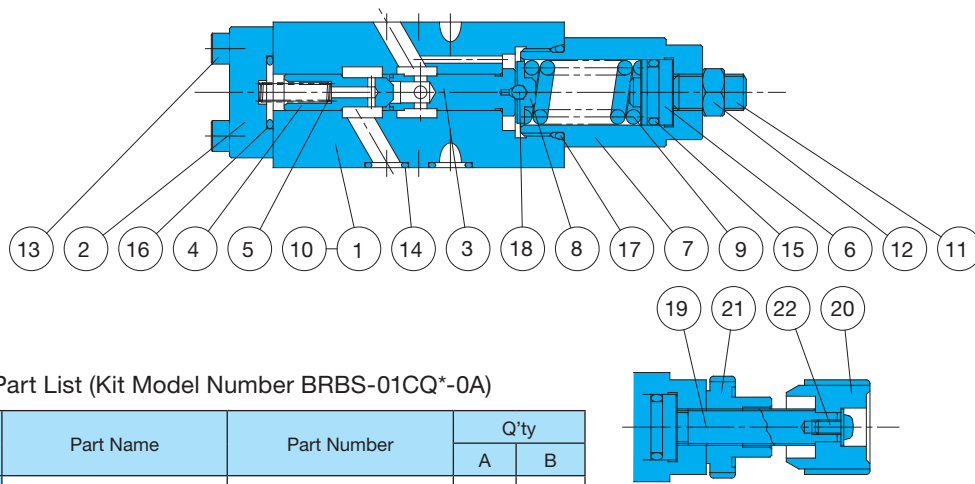


Number of Adjusting Screw Rotations — Pressure Characteristics



Cross-sectional Drawings

OCQ-G01-A1*-20



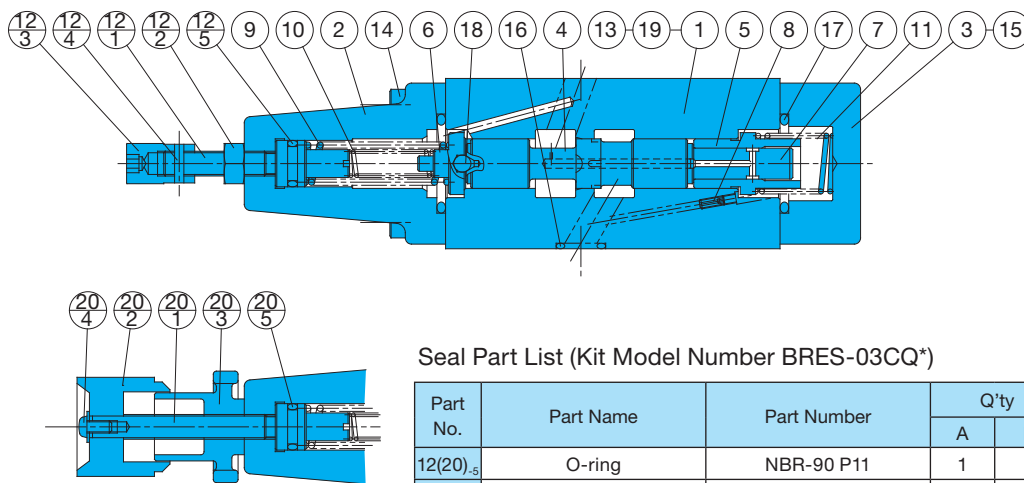
Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Spring
6	Plunger
7	Retainer
8	Guide
9	Spring
10	Plate
11	Screw
12	Nut
13	Screw
14	O-ring
15	O-ring
16	O-ring
17	O-ring
18	Ball
19	Screw
20	Knob
21	Nut
22	Screw

Seal Part List (Kit Model Number BRBS-01CQ*-0A)

Part No.	Part Name	Part Number	Q'ty	
			A	B
14	O-ring	AS568-012(NBR-90)	4	4
15	O-ring	NBR-90 P14	1	1
16	O-ring	NBR-90 P16	1	1
17	O-ring	NBR-90 P22	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify A or B for the asterisk (*) in the kit model number.

OCQ-G03-A1*-J50



Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Spool
5	Sleeve
6	Guide
7	Plunger
8	Choke
9	Spring
10	Spring
11	Spring
12	Screw kit
12.1	Screw
12.2	Nut
12.3	Nut
12.4	Pin
12.5	O-ring
13	Plate
14	Screw
15	Screw
16	O-ring
17	O-ring
18	Ball
19	Pin
20	Handle kit
20.1	Screw
20.2	Knob
20.3	Nut
20.4	Screw
20.5	O-ring

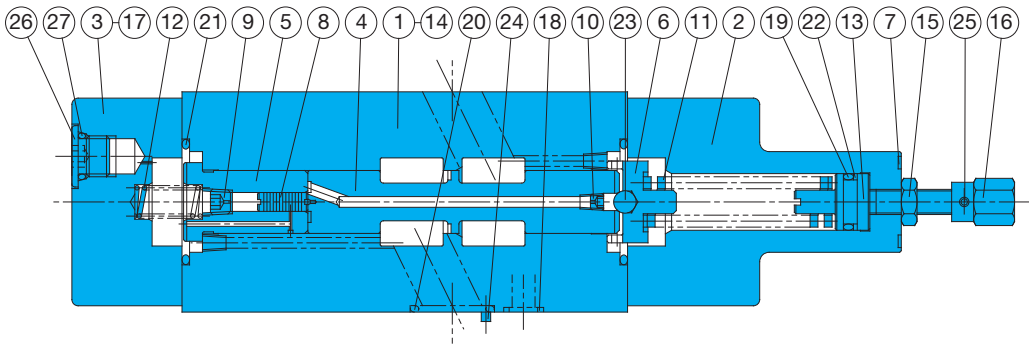
Seal Part List (Kit Model Number BRES-03CQ*)

Part No.	Part Name	Part Number	Q'ty	
			A	B
12(20) ₅	O-ring	NBR-90 P11	1	1
16	O-ring	AS568-014(NBR-90)	5	5
17	O-ring	NBR-90 P26	2	2

Note) The 10 spring is not included with pressure adjustment Type A.

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify A or B for the asterisk (*) in the kit model number.

OQH-G04-B1*-10



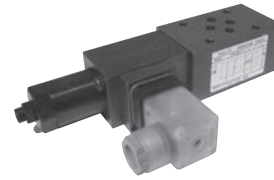
Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Spool
5	Sleeve
6	Guide
7	Plate
8	Plunger
9	Choke
10	Choke
11	Spring
12	Spring
13	Screw
14	Plate
15	Nut
16	Nut
17	Screw
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	Backup ring
23	Ball
24	Pin
25	Pin
26	Plug
27	O-ring

Seal Part List (Kit Model Number BRKS-04CQ*)

Part No.	Part Name	Part Number	Q'ty	
			A	B
18	O-ring	AS568-012(NBR-90)	2	2
19	O-ring	NBR-90 P14	1	1
20	O-ring	AS568-118(NBR-90)	4	4
21	O-ring	NBR-90 G35	2	2
22	Backup ring	T2-P14	1	1
27	O-ring	NBR-90 P11	1	1

Note) The illustration shows the configuration for pressure adjustment ranges Type C and Type E. For Type A, there is no #8 piston or #10 choke.

- Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Backup ring indicates JIS 2407-T2-**.
 3. Specify A or B for the asterisk (*) in the kit model number.



Pressure Switch Modular Valve

50ℓ/min
25MPa

Features

- ① This modular valve detects pressure changes inside the hydraulic circuit and opens and closes an electrical circuit accordingly.
- ② High precision detection, high precision circuit control, outstanding reliability.
- ③ Maximum operating pressure: 25MPa {255kgf/cm²}
- ④ Indicator light built into the DIN connector shows operational status at a glance.
- ⑤ A double type is also available for control of both port A and port B in a compact configuration.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure Adjustment Range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OW-G01-PC-R-**-30 P1 P3	1/8	25{255}	50	0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.8	ISO 4401-03-02-0-05
OW-G01-AC-R-**-30 A1 A3				0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}		
OW-G01-BC-R-**-30 B1 B3				0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}	1.8	
OW-G01-WC-R-**-30 W1 W3				0.5 to 3.5{ 5.1 to 35.7} 0.8 to 7{ 8.2 to 71.4} 3.5 to 21{35.7 to 214}		

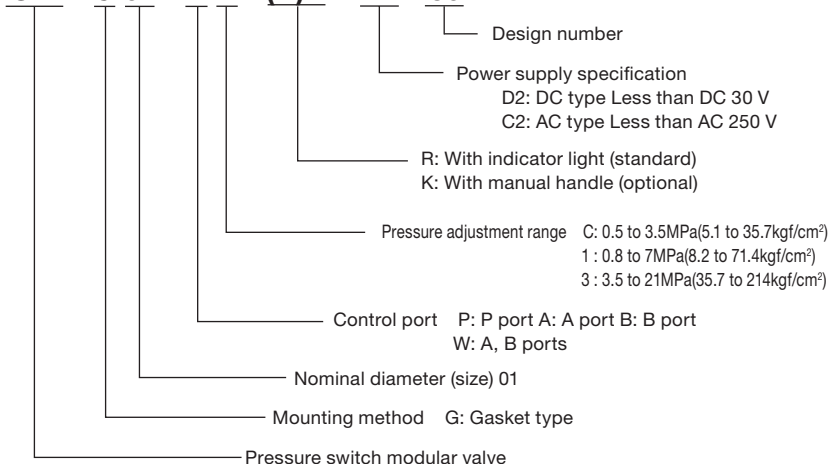
Electrical Specifications Micro Switch Manufacturer: Omron Model No. SS-5	Contact Capacitance (Resistive Load)	AC	125V	5A
			250V	3A
		DC	14V	5A
			30V	4A
	Mechanical Life	At least 1 × 10 ⁷		
	Electrical Life	At least 3 × 10 ⁶ (AC, 0.1A, cosφ=1)		
	Contact Resistance	30MΩ maximum (initial value)		
Insulation Resistance	At least 100MΩ			
Allowable Operating Frequency	60 times/minute (electrical)			
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C0920 IP64		
	Ambient Temperature	-20°C to 70°C (non-condensation)		
	Operating Fluid	Oil Temperature	-20°C to 70°C	Use a fluid that is within both ranges.
		Allowable kinematic viscosity Range	15 to 300mm ² /s(cSt)	
		Filtration	25μm maximum	

● Handling

- ① See the detailed explanation on the next page for information about wiring inside connectors.
- ② Contacts are normally open type only, not normally closed type.
- ③ In addition to load wiring, power supply wiring is also required to illuminate the indicator light. See the wiring diagram for more information.
- ④ If the DIN connector interferes with other valves, remove the two switch installation bolts and change the installation orientation. If interference is caused in all orientations, install an interference blanker plate on top of the connector. Contact your agent if an interference blanker plate is required.
- ⑤ Note that a special type of DIN connector is required. The DIN connector is not interchangeable with the one for the SA type solenoid valve.
- ⑥ If you cannot remove the DIN connector when wiring, remove the switch installation bolts and then remove the DIN connector. The tightening torque for the installation bolts is 5 to 7Nm {51 to 71kgf/cm}.
- ⑦ This valve has drain volume the same as the OG-GO1 (decompression valve) the port for detecting structural pressure.
- ⑧ Do not include inductive components or capacitive components in the loaded circuit that connects to the valves because they significantly reduce the life of the micro-switches. Contact us for details.

Explanation of model No.

OW - G 01 - P 1 - (K)R - D2 - 30



● Connectors

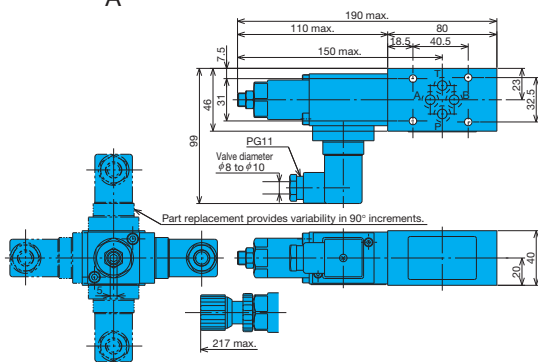
Model No.	Power supply specification	Wiring	Electrical Circuit Diagram
BRC41-01WD2	D2	<p>○ When signal input device (load) remote common is plus</p> <p>OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 to +).</p>	<p>Normal open type with indicator</p> <p>Pressure increase causes indicator to light. Circuit closed (ON)</p> <p>Pressure decrease causes indicator to go out. Circuit open (OFF)</p>
		<p>○ When signal input device (load) common is minus</p> <p>OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 to -).</p>	
BRC41-01WC2	C2	<p>○ When signal input device (load) is AC</p> <p>OW Terminal 1 is connected to load, while Terminals 2 and 3 are connected to power (Terminal 2 is nonpolar).</p>	<p>Normal open type with indicator</p> <p>Pressure increase causes indicator to light. Circuit closed (ON)</p> <p>Pressure decrease causes indicator to go out. Circuit open (OFF)</p>

- Note) 1. The DIN connector wiring connector port size is PG11.
 2. The compatible cable diameter for the DIN connector is $\phi 8$ to $\phi 10$. Dust resistance and water resistance is lost for any cable outside this range.
 3. The connector can be installed in different orientations are 90-degree increments by changing the orientation of the terminal block.
 4. The connector is designed so the cover cannot be removed unless the installation screws are removed.
 5. Use M3 for round type and Y type solderless terminals.
 6. The tightening torque of M3 screws used for securing connectors and for terminals is 0.3 to 0.5Nm.

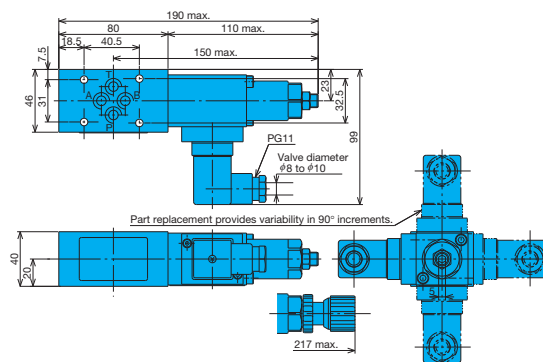
Installation Dimension Drawings

Note) Pressure is increased by clockwise (rightward) rotation of the adjusting screw, and decreased by counterclockwise (leftward) rotation.

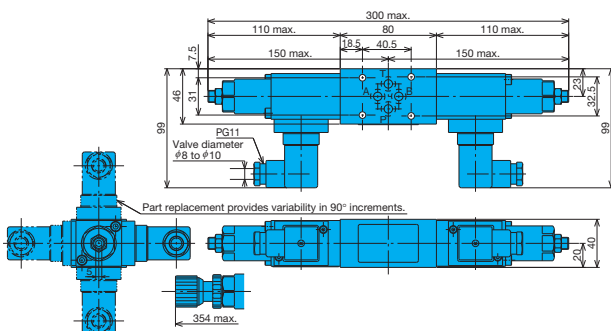
OW-G01-P*-R-*2-30
A



OW-G01-B*-R-*2-30



OW-G01-W*-R-*2-30

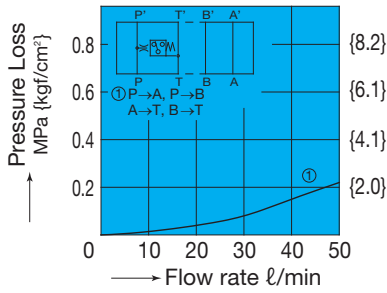


Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

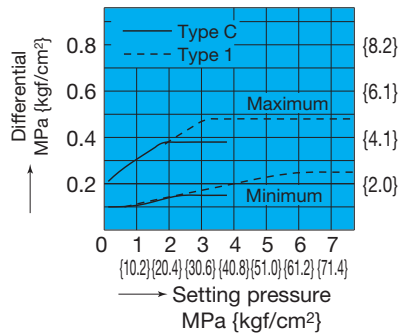
Pressure Loss Characteristics

OW-G01-**-R**-30

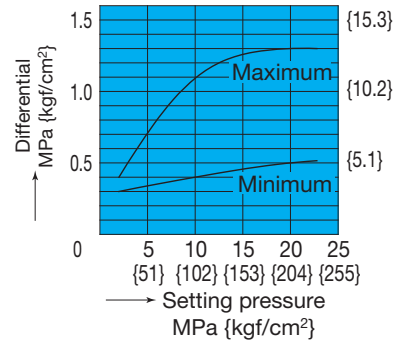


Setting Pressure — Differential Characteristics

OW-G01-^C₁-R**-30

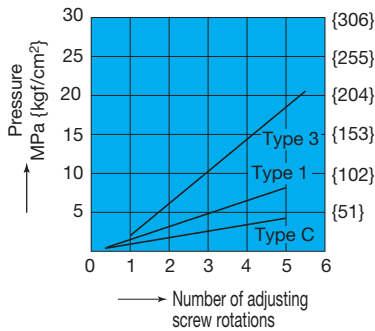


OW-G01-³-R**-30



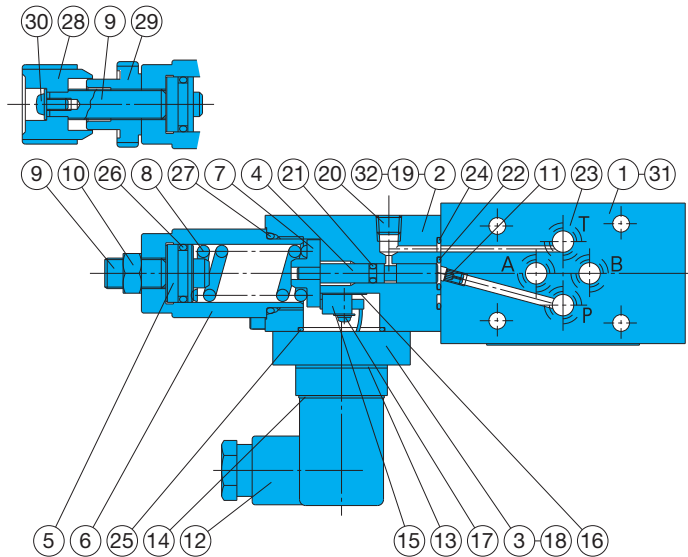
Number of Adjusting Screw Rotations — Pressure Characteristics

OW-G01-**-R**-30



Cross-sectional Drawing

OW-G01-P*-R*-2-30



Part No.	Part Name	Part No.	Part Name
1	Body	17	Screw
2	Cover	18	Screw
3	Cover	19	Screw
4	Piston	20	Plug
5	Push rod	21	O-ring
6	Retainer	22	O-ring
7	Guide	23	O-ring
8	Spring	24	O-ring
9	Screw	25	O-ring
10	Nut	26	O-ring
11	Choke	27	O-ring
12	Connector	28	Knob
13	Gasket	29	Nut
14	Gasket	30	Screw
15	Micro switch assy	31	Plate
16	Separator	32	Plate

Seal Part List (Kit Model Number BRCS-01W*-0A)

Part No.	Part Name	Part Number	Q'ty			
			P	W	A	B
21	O-ring	NBR-70-1 P3	1	2	1	1
22	O-ring	AS568-011(NBR-90)	1	2	1	1
23	O-ring	AS568-012(NBR-90)	4	4	4	4
24	O-ring	AS568-019(NBR-70-1)	1	2	1	1
25	O-ring	AS568-022(NBR-70-1)	1	2	1	1
26	O-ring	NBR-70-1 P15	1	2	1	1
27	O-ring	NBR-90 P22	1	2	1	1

Note) Specify P, W, A, or B for the asterisk (*) in the kit model number.



Flow Regulator Modular Valve

50 to 300ℓ/min
25,35MPa

Features

- ① This modular valve is used to control actuator speed and for other flow control valve applications.
- ② A wide range of models are available for A and B port control, A or B port control, and P or T port control.
- ③ Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Check Valve Cracking pressure MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OY-G01-T-20	1/8	25{255}	50	-	1.0	ISO 4401-03-02-0-05
OCY-G01-P-20				0.04{0.4}	1.0	
OCY-G01-W-X-20 A B				0.08{0.8}	1.3	
					1.2	
OCY-G01-W-Y-20 A B				0.08{0.8}	1.3	
		1.2				
OCY-G03-P-J50	3/8	25{255}	100	0.04{0.4}	2.9	ISO 4401-05-04-0-05
OCY-G03-W-X-J51 A B				0.1{1.0}	3.1	
					3.0	
OCY-G03-W-Y-J51 A B				0.1{1.0}	3.1	
		3.0				
OYH-G04-P-10	1/2	35{357}	300	0.04{0.4}	4.7	ISO 4401-07-06-0-05
OYH-G04-W-X-10 A B				0.1{1.0}	6.5	
					6.3	
OYH-G04-W-Y-10 A B				0.1{1.0}	6.5	
		6.3				

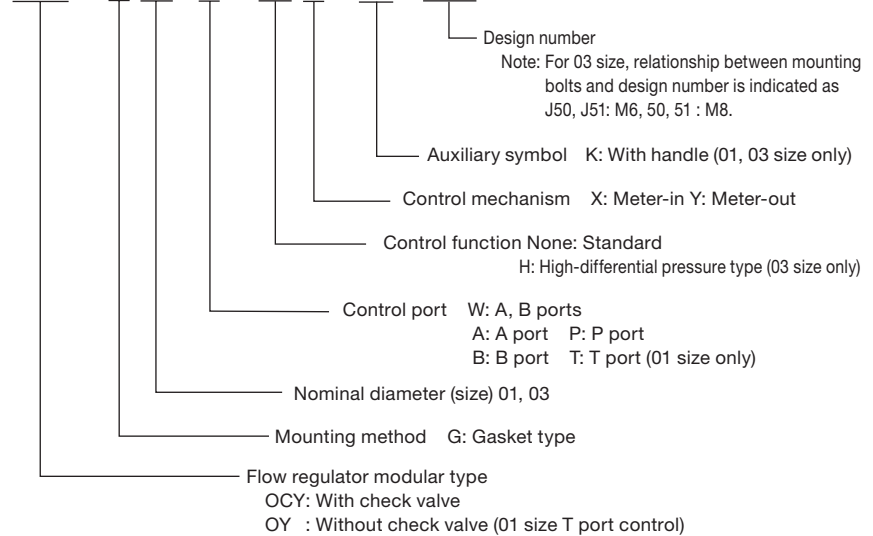
● Handling

- ① In a 03 size application where control differential pressure is large, use of an H type makes adjustment easier.
- ② Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ③ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

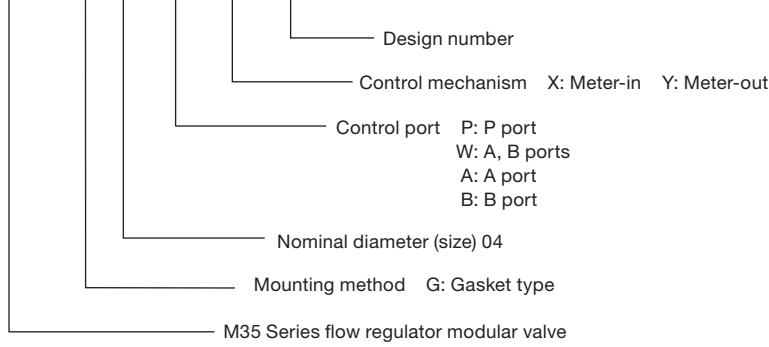
OCY - G 03 - W - (H) Y - (K) - J51



Explanation of model No.

04 size

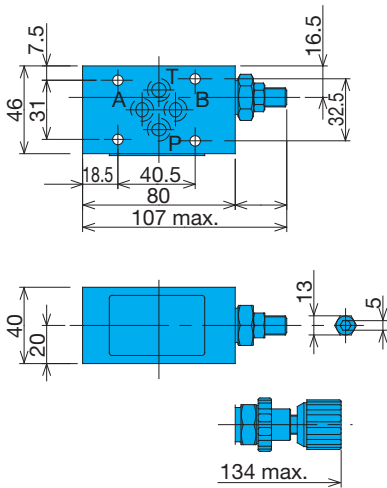
OYH - G 04 - W - Y - 10



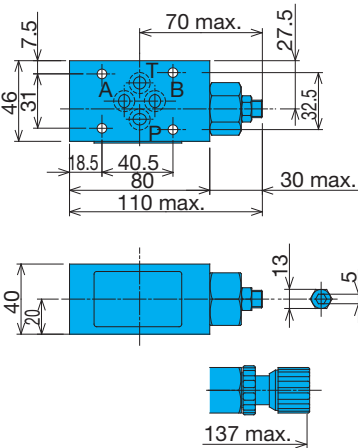
Installation Dimension Drawings

Note) The control flow rate is increased by counter clockwise (leftward) rotation of the adjusting screw.

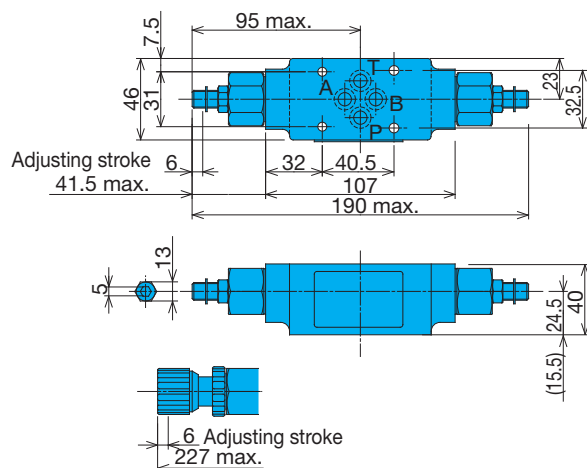
OY-G01-T-20



OCY-G01-P-20

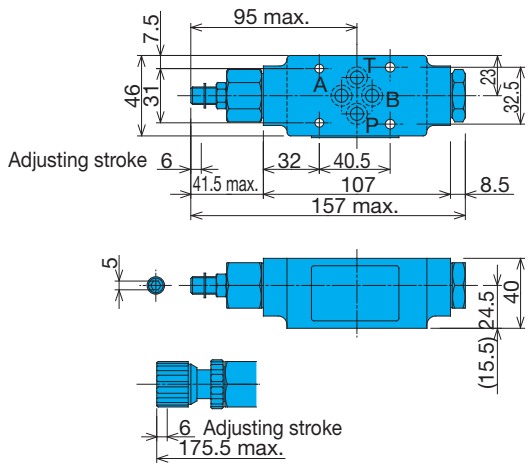


OCY-G01-W-X-Y-20



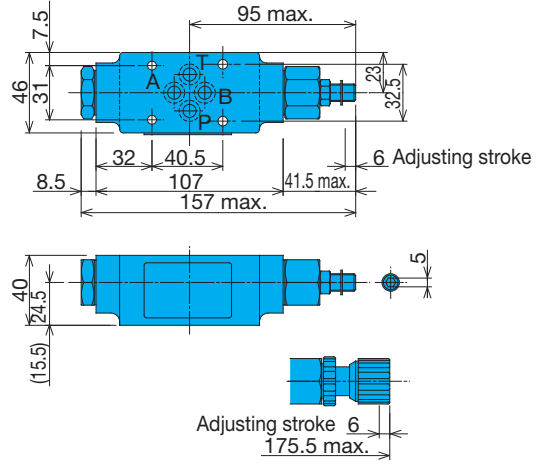
Note) Dimensions in the parentheses are for the OCY-G01-W-X-20.

OCY-G01-A-X_Y-20



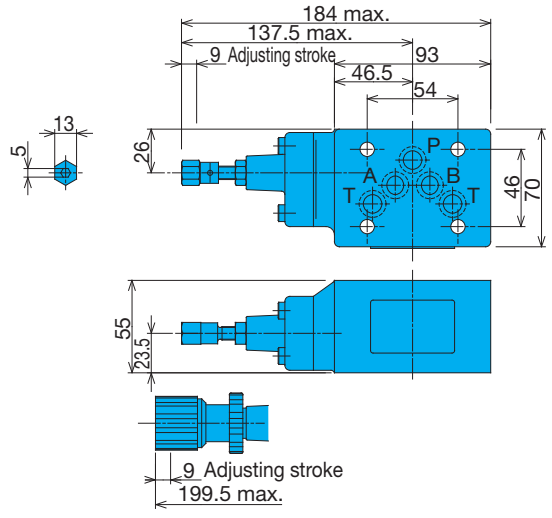
Note) Dimensions in the parentheses are for the OCY-G01-A-X-20.

OCY-G01-B-X_Y-20

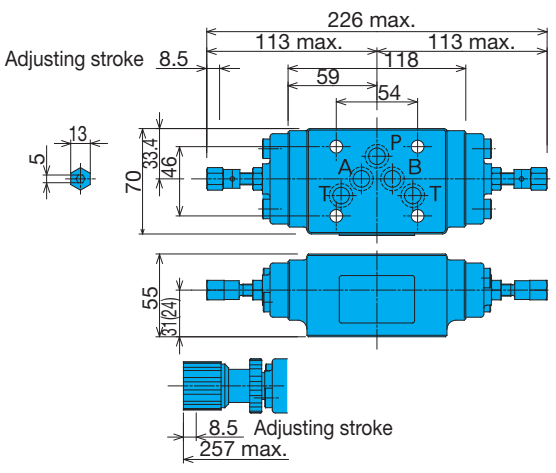


Note) Dimensions in the parentheses are for the OCY-G01-B-X-20.

OCY-G03-P-J50

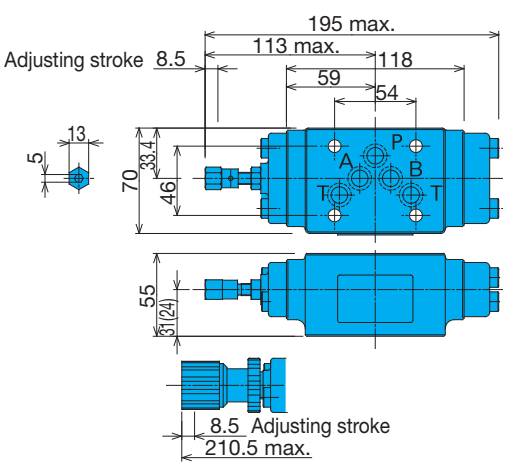


OCY-G03-W-X_Y-J51



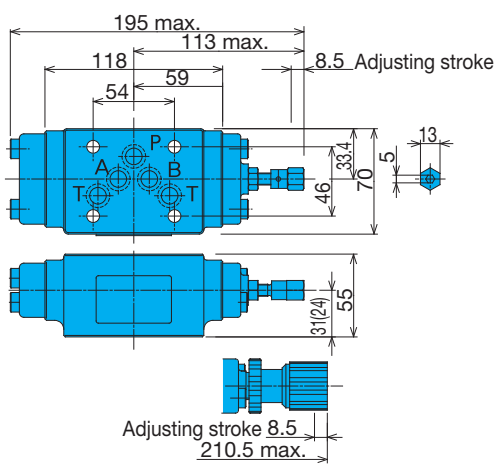
Note) Dimensions in the parentheses are for the OCY-G03-W-X-J51.

OCY-G03-A-X_Y-J51



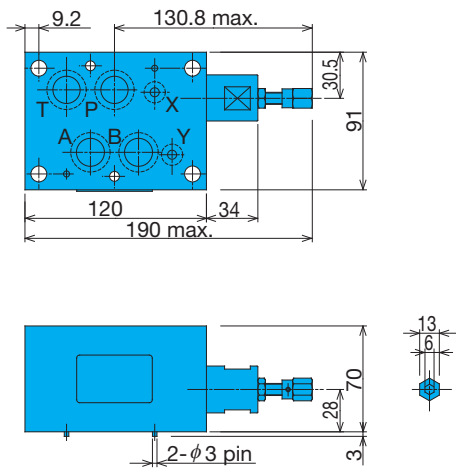
Note) Dimensions in the parentheses are for the OCY-G03-A-X-J51.

OCY-G03-B-X_Y-J51

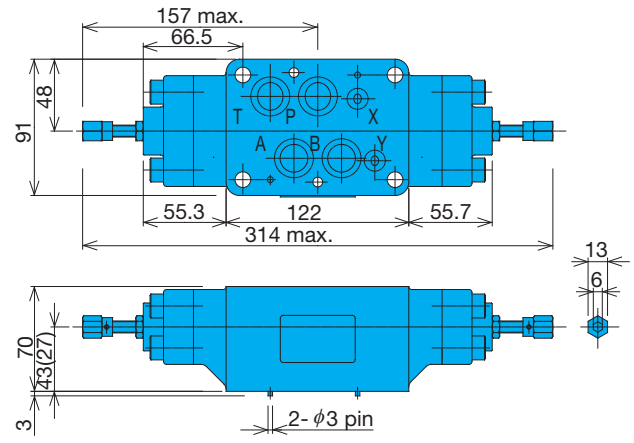


Note) Dimensions in the parentheses are for the OCY-G03-B-X-J51.

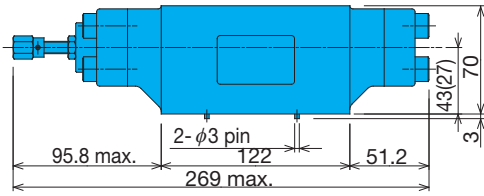
OYH-G04-P-10



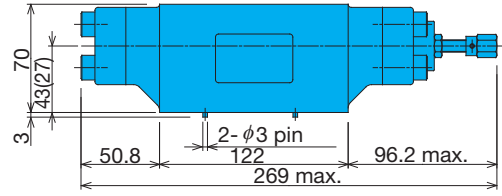
OYH-G04-W-X_Y-10



OYH-G04-A-X_Y-10



OYH-G04-B-X_Y-10



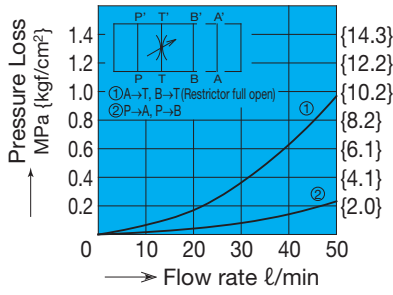
Note) Dimensions in the parentheses are for the OYH-G04-*_X-10.

Performance Curves

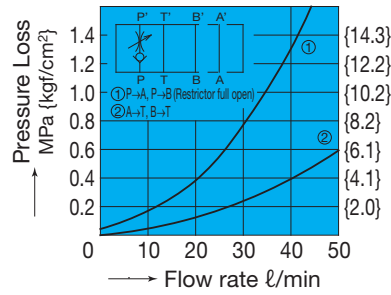
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

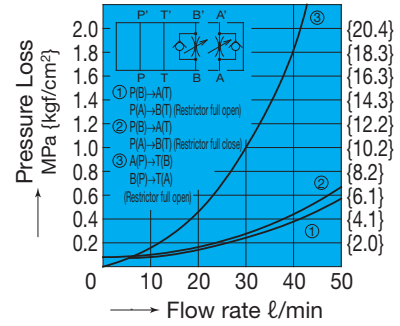
OY-G01-T-20



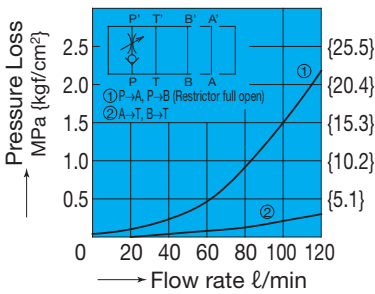
OCY-G01-P-20



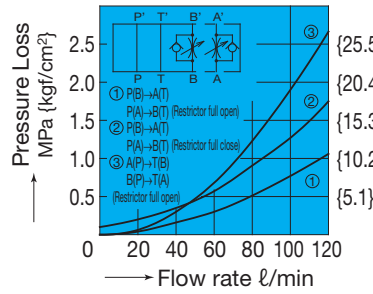
OCY-G01-W-Y-20
(OCY-G01-W-X-20)



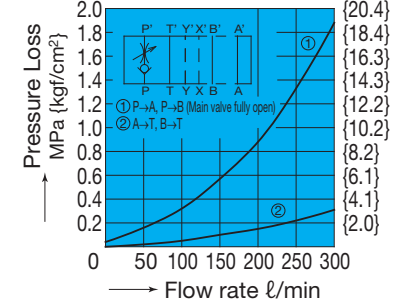
OCY-G03-P-J50



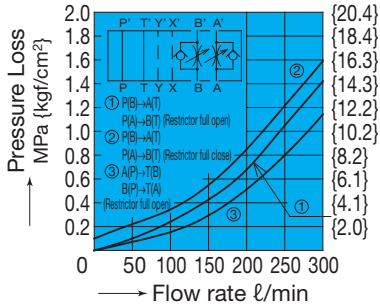
OCY-G03-W-Y-J51
(OCY-G03-W-X-J51)



OYH-G04-P-10

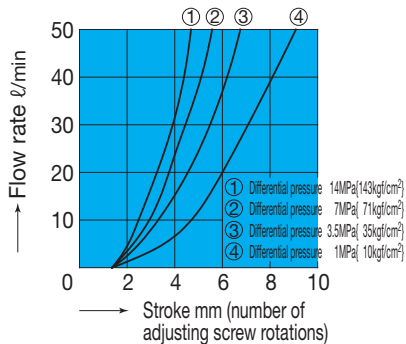


OYH-G04-W-Y-10
(OYH-G04-W-X-10)

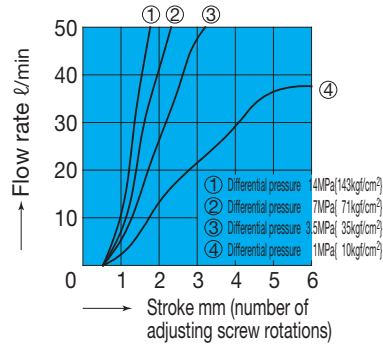


Stroke — Flow Rate Characteristics

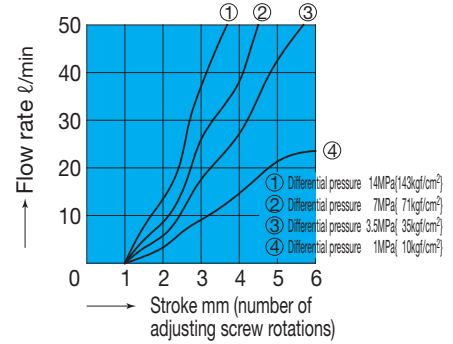
OY-G01-T-20



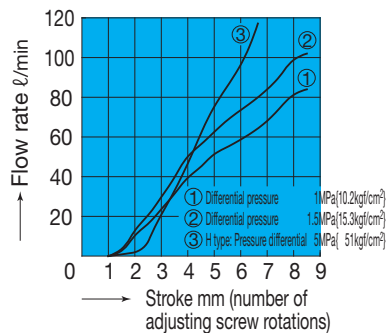
OCY-G01-P-20



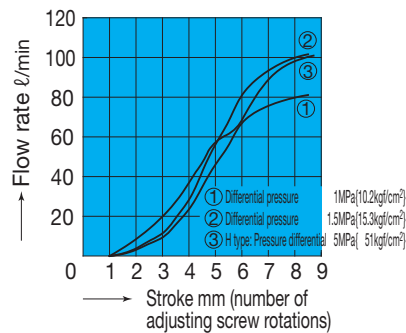
OCY-G01-*-*-20



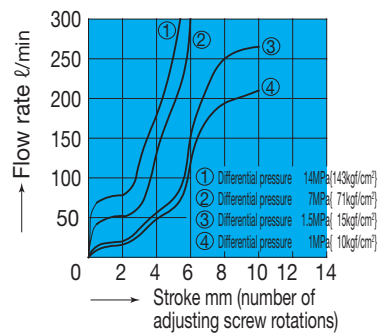
OCY-G03-P-(H)-J50



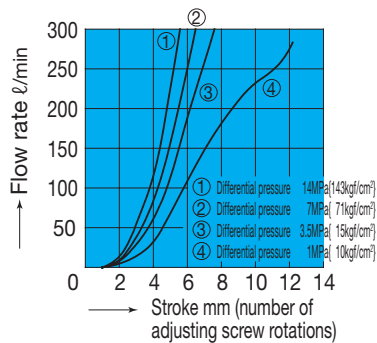
OCY-G03-W-(H)Y-J51



OYH-G04-P-10

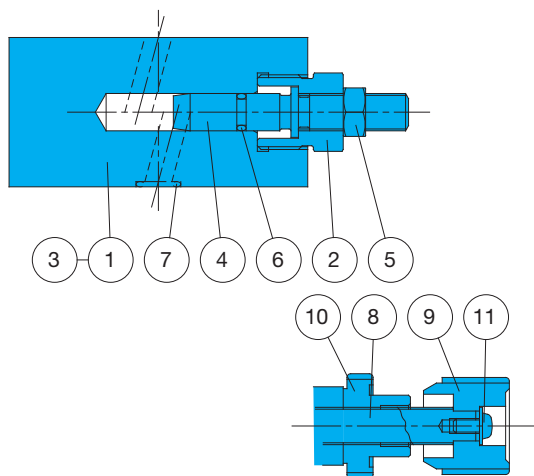


OYH-G04-W-Y-10



Cross-sectional Drawings

OY-G01-T-20



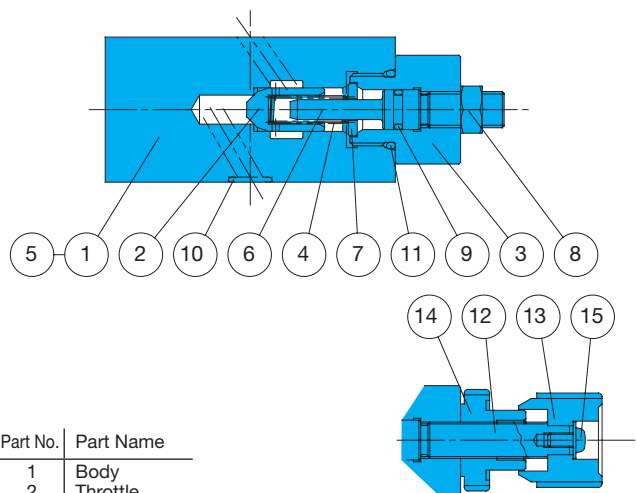
Part No.	Part Name
1	Body
2	Retainer
3	Plate
4	Screw
5	Nut
6	O-ring
7	O-ring
8	Screw
9	Knob
10	Nut
11	Screw

Seal Part List (Kit Model Number BFBS-01YT-0A)

Part No.	Part Name	Part Number	Q'ty
6	O-ring	NBR-90 P7	1
7	O-ring	AS568-012(NBR-90)	4

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCY-G01-P-20

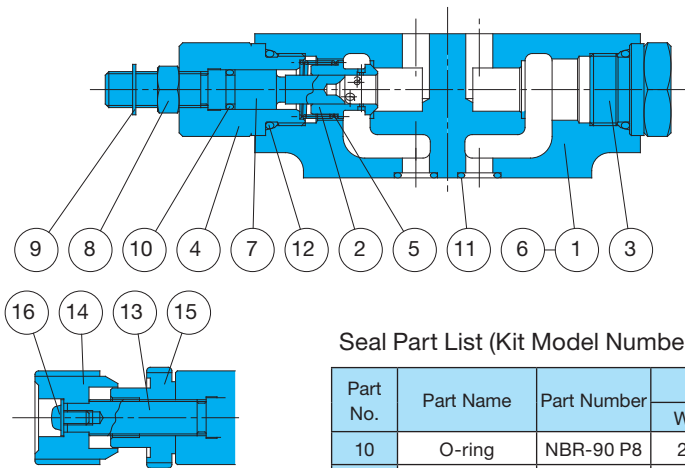


Part No.	Part Name
1	Body
2	Throttle
3	Retainer
4	Spring
5	Plate
6	Screw
7	Ring
8	Nut
9	O-ring
10	O-ring
11	O-ring
12	Screw
13	Knob
14	Nut
15	Screw

Seal Part List (Kit Model Number BFBS-01CYP-0A)

Part No.	Part Name	Part Number	Q'ty
9	O-ring	NBR-90 P8	1
10	O-ring	AS568-012(NBR-90)	4
11	O-ring	NBR-90 P18	1

Note) The materials and hardness of the O-ring conform with JIS B2401.



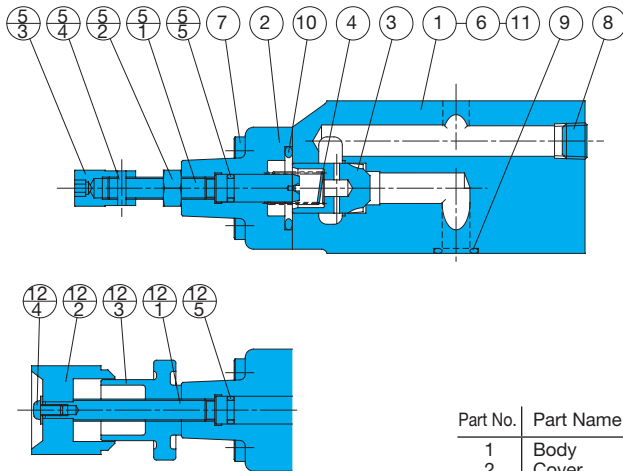
Seal Part List (Kit Model Number BFBS-01CY*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
10	O-ring	NBR-90 P8	2	1	1
11	O-ring	AS568-012(NBR-90)	4	4	4
12	O-ring	NBR-90 P18	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Throttle
3	Bushing
4	Retainer
5	Spring
6	Plate
7	Screw
8	Nut
9	E-ring
10	O-ring
11	O-ring
12	O-ring
13	Screw
14	Knob
15	Nut
16	Screw

OCY-G03-P-J50



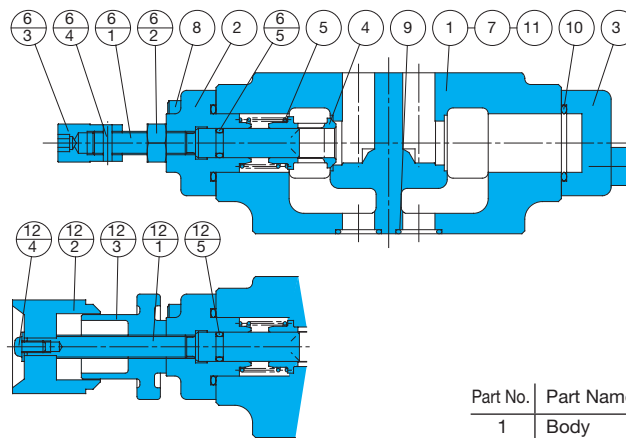
Seal Part List (Kit Model Number BFES-03CYP)

Part No.	Part Name	Part Number	Q'ty
			P
5(12) _{.5}	O-ring	NBR-90 P7	1
9	O-ring	AS568-014(NBR-90)	5
10	O-ring	NBR-90 P24	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Cover
3	Throttle
4	Spring
5	Screw kit
5-1	Screw
5-2	Nut
5-3	Nut
5-4	Pin
5-5	O-ring
6	Plate
7	Screw
8	Plug
9	O-ring
10	O-ring
11	Pin
12	Handle kit
12-1	Screw
12-2	Knob
12-3	Nut
12-4	Screw
12-5	O-ring

OCY-G03-A-Y-J51



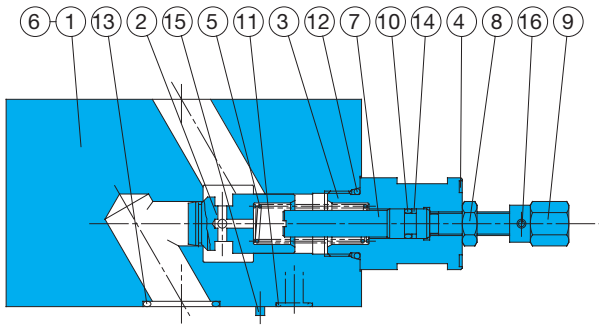
Seal Part List (Kit Model Number BFES-03CY*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
6(12) _{.5}	O-ring	NBR-90 P7	2	1	1
9	O-ring	AS568-014(NBR-90)	5	5	5
10	O-ring	NBR-90 P22	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Throttle
5	Spring
6	Screw kit
6-1	Screw
6-2	Nut
6-3	Nut
6-4	Pin
6-5	O-ring
7	Plate
8	Screw
9	O-ring
10	O-ring
11	Pin
12	Handle kit
12-1	Screw
12-2	Knob
12-3	Nut
12-4	Screw
12-5	O-ring

OYH-G04-P-10



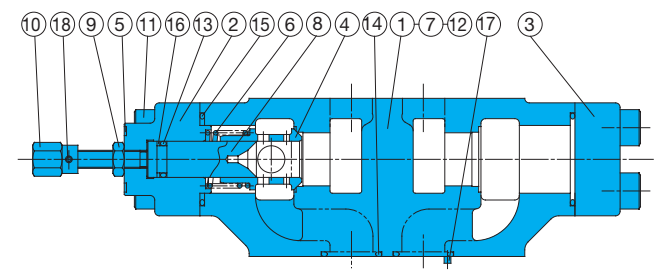
Seal Part List
(Kit Model Number BFKS-04CYP)

Part No.	Part Name	Part Number	Q'ty
			P
10	O-ring	NBR-90 P7	1
11	O-ring	AS568-012(NBR-90)	2
12	O-ring	NBR-90 P20	1
13	O-ring	AS568-118(NBR-90)	4
14	Backup ring	T2-P7	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Backup ring indicates JIS B 2407-T2-**.

Part No.	Part Name
1	Body
2	Throttle
3	Retainer
4	Plate
5	Spring
6	Plate
7	Screw
8	Nut
9	Nut
10	O-ring
11	O-ring
12	O-ring
13	O-ring
14	Backup ring
15	Pin
16	Pin

OYH-G04-A-Y-10



Seal Part List
(Kit Model Number BFKS-04CY*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	AS568-012 (NBR-90)	2	2	2
13	O-ring	NBR-70-1 P12	2	1	1
14	O-ring	AS568-118 (NBR-90)	4	4	4
15	O-ring	AS568-127 (NBR-90)	2	2	2
16	Backup ring	T2-P12	2	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Backup ring indicates JIS B 2407-T2-**.
3. Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Throttle
5	Plate
6	Spring
7	Plate
8	Screw
9	Nut
10	Nut
11	Screw
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	Backup ring
17	Pin
18	Pin



Flow Control Modular Valve (Pressure and temperature compensated)

20 to 200ℓ/min
21,25,35MPa

Features

- ① This modular valve is used to control actuator speed and for other flow control valve applications.
- ② A wide range of models are available for A and B port control, A or B port control, and P port control.
- ③ A pressure compensation mechanism ensures that the control flow rate does not change, even when there is pressure fluctuation.
- ④ The control flow rate remains stable, even when oil temperature changes.
- ⑤ Maximum Operating Pressure : 21, 25, 35MPa {214, 255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Control Flow Rate ℓ/min	Check Valve Cracking pressure MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
OF-G01-P20-20	1/8	21 {214}	0.1 to 20(differential pressure: 7MPa{71.4kgf/cm ² }) 0.3 to 20(differential pressure:21MPa{214kgf/cm ² })	-	1.2	ISO 4401-03-02-0-05
OCF-G01-W40-X-30 A40 B40		25 {255}	0.1 to 40(differential pressure: 7MPa{71.4kgf/cm ² }) 0.5 to 40(differential pressure:25MPa{255kgf/cm ² })	0.08 {0.8}	1.7	
OCF-G01-W40-Y-30 A40 B40				0.08 {0.8}	1.5	
OF-G03-P60-J50	3/8	25 {255}	0.3 to 60(differential pressure: 7MPa{71.4kgf/cm ² }) 0.5 to 60(differential pressure:25MPa{255kgf/cm ² })	-	3.1	ISO 4401-05-04-0-05
OCF-G03-W60-X-J50 A60 B60			0.5 to 60(differential pressure: 7MPa{71.4kgf/cm ² }) 1 to 60(differential pressure:25MPa{255kgf/cm ² })	0.1 {1.0}	5.0	
OCF-G03-W60-Y-J50 A60 B60				0.1 {1.0}	4.6	
OFH-G04-W200-X-10 A200 B200	1/2	35 {357}	10 to 200(differential pressure:21MPa{214kgf/cm ² }) 15 to 200(differential pressure:25MPa{255kgf/cm ² }) 20 to 200(differential pressure:35MPa{357kgf/cm ² })	0.1 {1.0}	11.1	ISO 4401-07-06-0-05
OFH-G04-W200-Y-10 A200 B200					10.2	
					11.1	
					10.2	

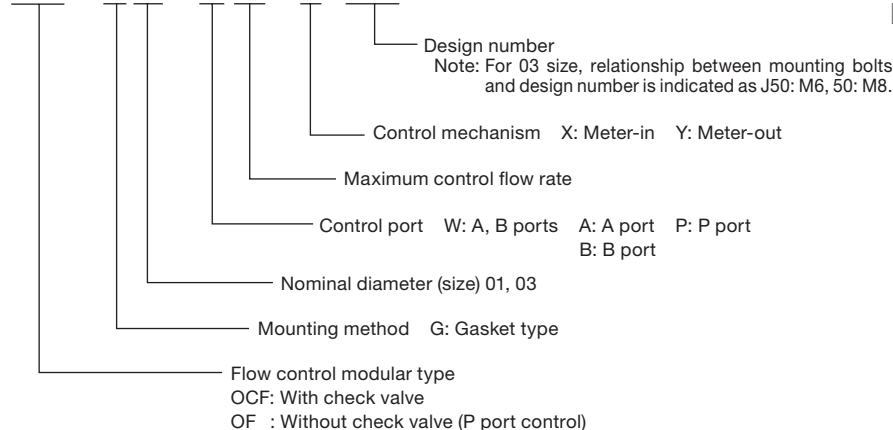
● Handling

- ① For flow rate control, make sure that the pressure differential between the input port and output port is at least 1MPa {10.2kgf/cm²}. See the Flow Rate - Minimum Differential Pressure Characteristics for information about the OCF-G01 and OFF-04 maximum control flow rate.
- ② The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control knob.
- ③ Pressure rate control knob rotation resistance will increase as the pressure increases. However, do not use a spanner or other tool that fits around the knob to turn it. Instead, insert a 5mm hex spanner into the hex hole in the center of the knob and rotate it that way.
- ④ After adjusting the flow rate, fix it in place by turning the lock screw on the end of the knob to the right.
- ⑤ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑥ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).
- ⑦ Flow rate fluctuation is ±5% within the temperature range of 20°C to 60°C.

Explanation of model No.

01, 03 size

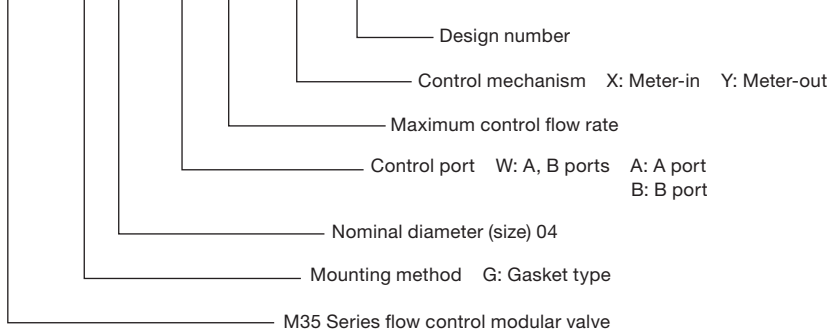
OCF - G 03 - W 60 - Y - J50



Explanation of model No.

04 size

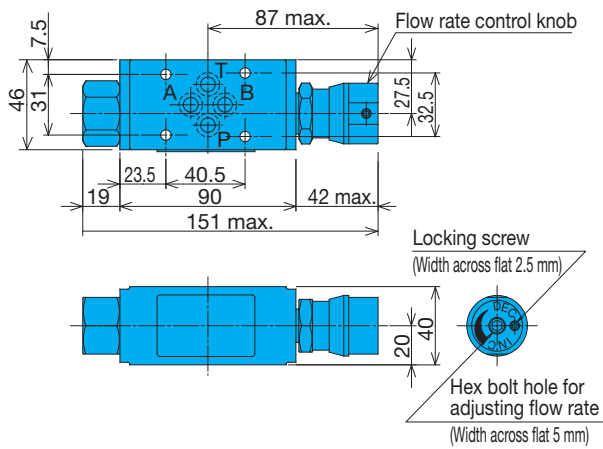
OFH - G 04 - W 200 - Y - 10



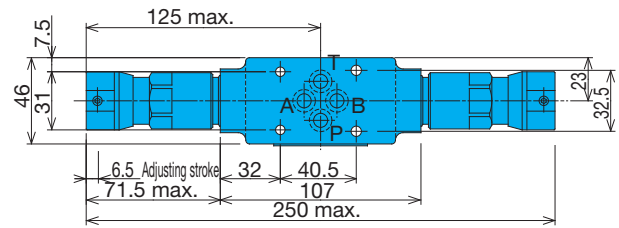
Installation Dimension Drawings

Note) The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control knob.

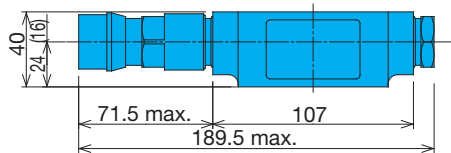
OF-G01-P20-20



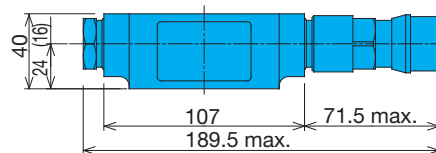
OCF-G01-W40-X/Y-30



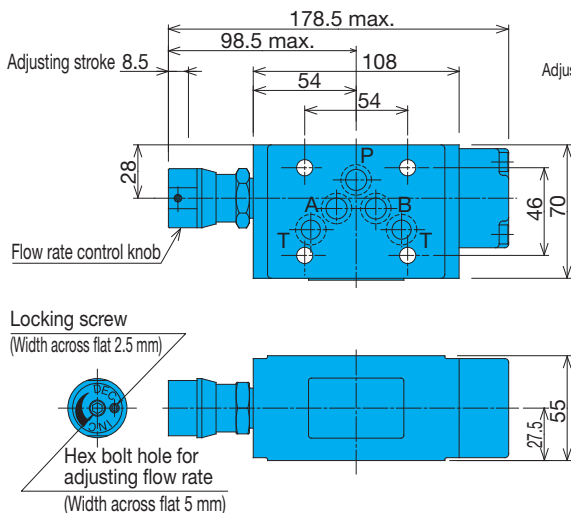
OCF-G01-A40-X/Y-30



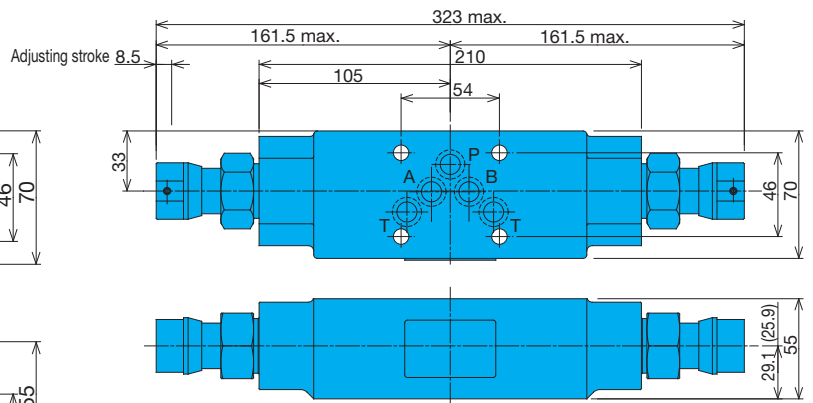
OCF-G01-B40-X/Y-30



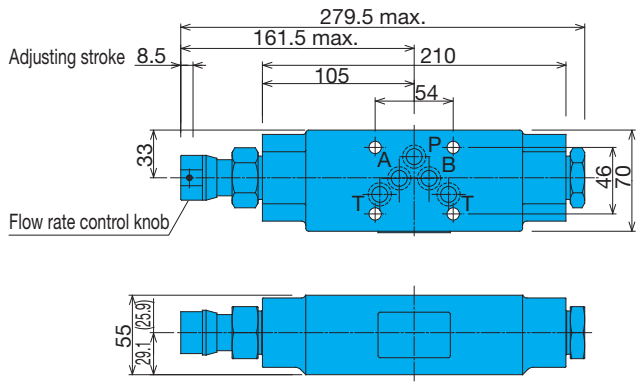
OF-G03-P60-J50



OCF-G03-W60-X/Y-J50

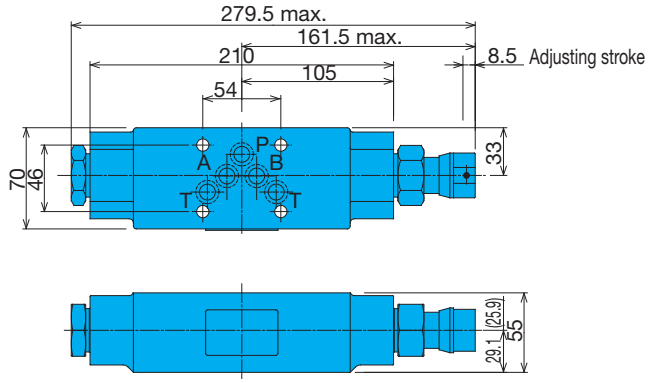


OCF-G03-A60-X/Y-J50



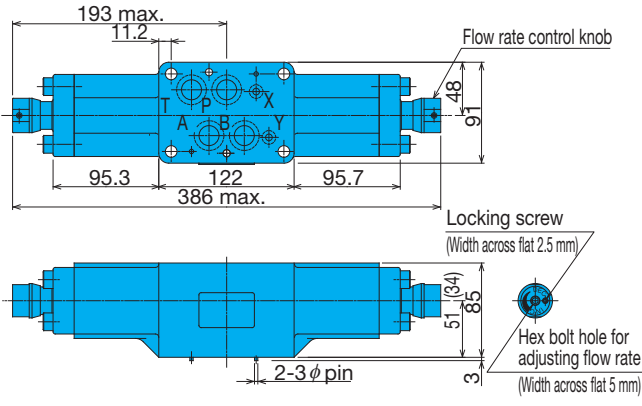
Note) Dimensions in the parentheses are for the OCF-G03-A60-X-J50.

OCF-G03-B60-X/Y-J50



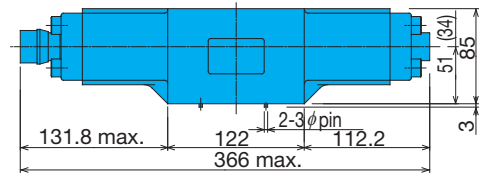
Note) Dimensions in the parentheses are for the OCF-G03-B60-X-J50.

OFH-G04-W200-X/Y-10



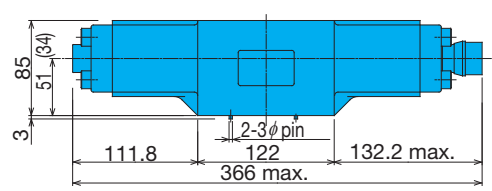
Note) Dimensions in the parentheses are for the OFH-G04-W200-X-10.

OFH-G04-A200-X/Y-10



Note) Dimensions in the parentheses are for the OCF-G04-A200-X-10.

OFH-G04-B200-X/Y-10



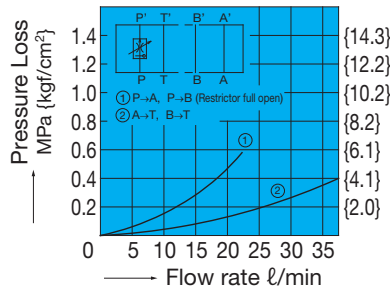
Note) Dimensions in the parentheses are for the OFH-G04-B200-X-10.

Performance Curves

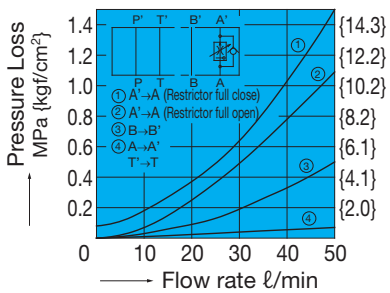
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

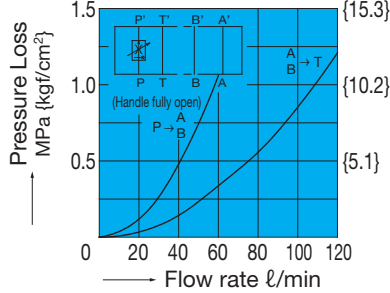
OF-G01-P20-20



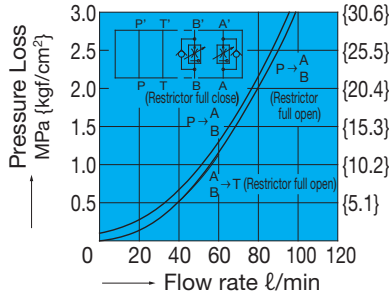
OCF-G01-A40-Y-30



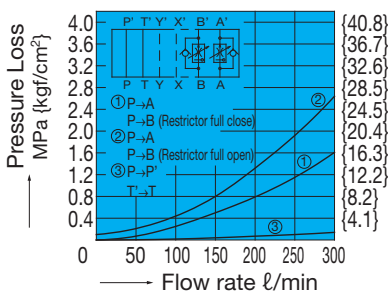
OF-G03-P60-J50



OCF-G03-W60-Y-J50

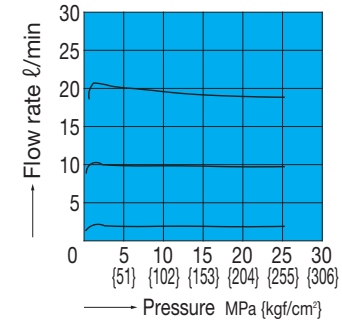


OFH-G04-W200-Y-10

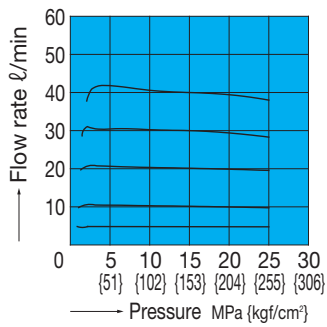


Pressure - Control Flow Rate Characteristics

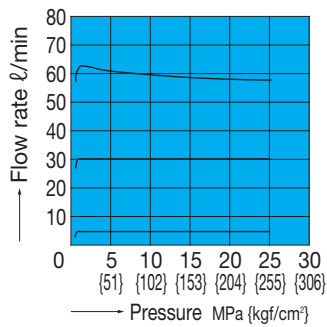
OF-G01-P20-20



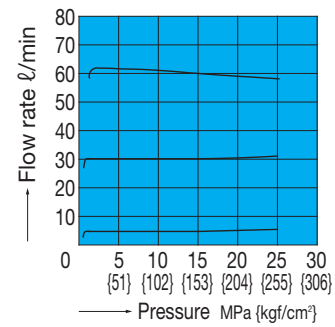
OCF-G01-*40-*-30



OF-G03-P60-J50

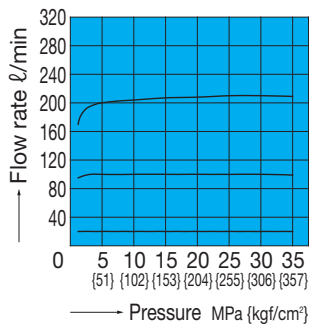


OCF-G03-W60-*-J50

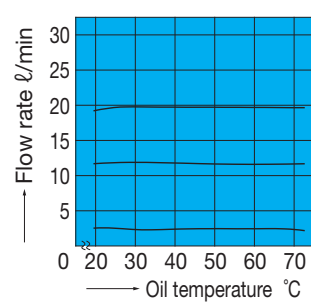


Oil Temperature – Control Flow Rate Characteristics

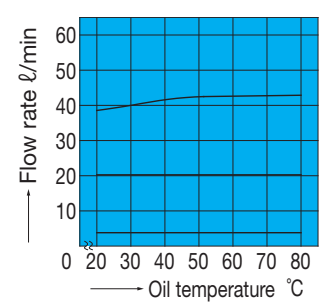
OFH-G04-W200-*-10



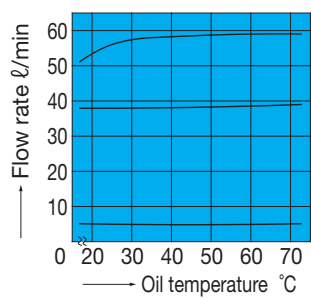
OF-G01-P20-20



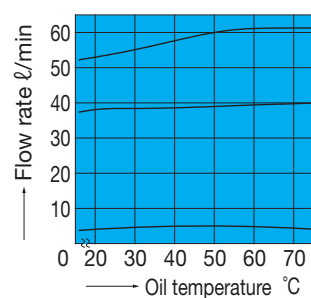
OCF-G01-*40-*-30



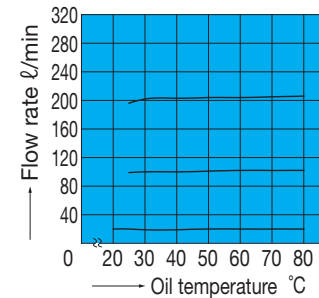
OF-G03-P60-J50



OCF-G03-W60-*-J50

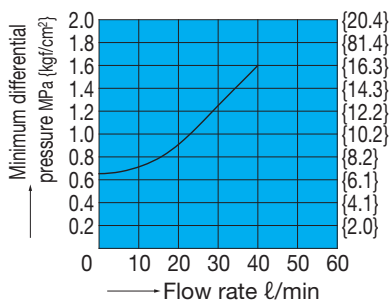


OFH-G04-W200-*-10

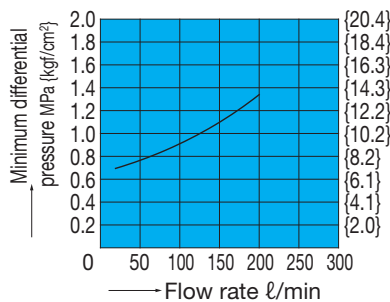


Flow Rate – Minimum Differential Pressure Characteristics

OCF-G01-*40-*-30

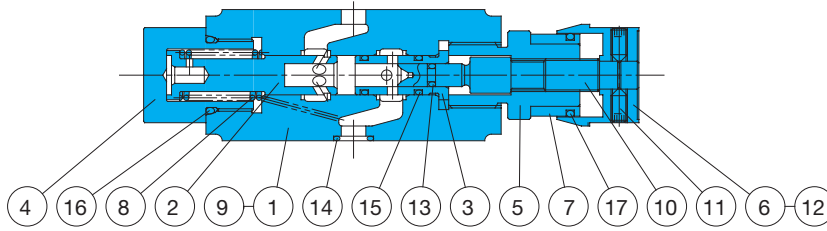


OFH-G04-W200-Y-10



Cross-sectional Drawings

OF-G01-P20-20



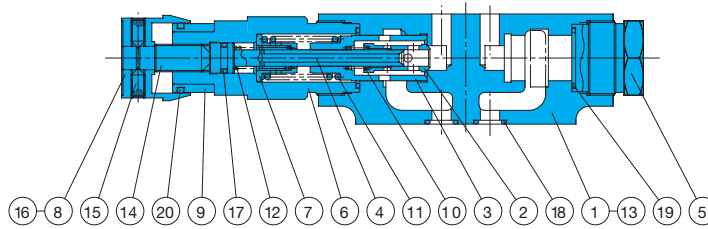
Seal Part List (Kit Model Number BFBS-01FP-0A)

Part No.	Part Name	Part Number	Q'ty	
			W	A
13	O-ring	NBR-90 P4	1	
14	O-ring	AS568-012(NBR-90)	4	
15	O-ring	NBR-90 P9	2	
16	O-ring	NBR-90 P20	1	
17	O-ring	NBR-70-1 P21	1	

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Piston
3	Sleeve
4	Bushing
5	Retainer
6	Knob
7	Dial
8	Spring
9	Plate
10	Screw
11	Screw
12	Screw
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	O-ring

OCF-G01-A40-Y-30



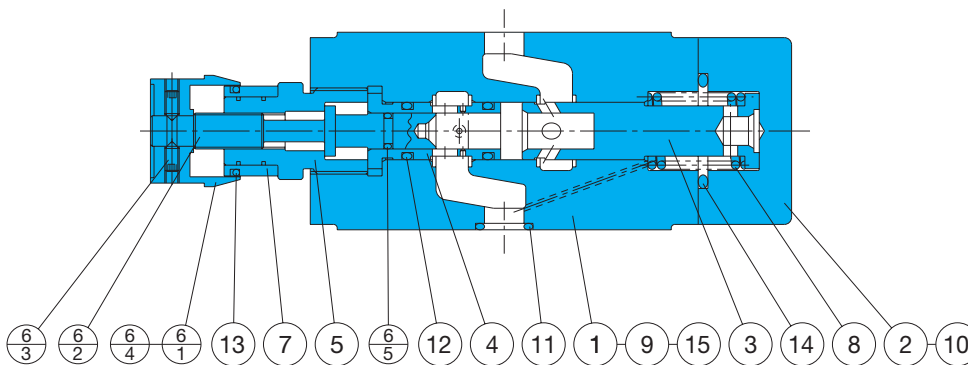
Seal Part List (Kit Model Number BFCS-01CF*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
17	O-ring	NBR-70-1 P8	2	1	1
18	O-ring	AS568-012(NBR-90)	4	4	4
19	O-ring	AS568-018(NBR-90)	2	2	2
20	O-ring	NBR-70-1 P21	1	1	1

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
2. Specify W, A, or B for the asterisk (*) in the kit model number.

Part No.	Part Name
1	Body
2	Throttle
3	Piston
4	Rod
5	Bushing
6	Retainer
7	Guide
8	Knob
9	Dial
10	Spring
11	Spring
12	Spring
13	Plate
14	Screw
15	Screw
16	Screw
17	O-ring
18	O-ring
19	O-ring
20	O-ring

OF-G03-P60-J50



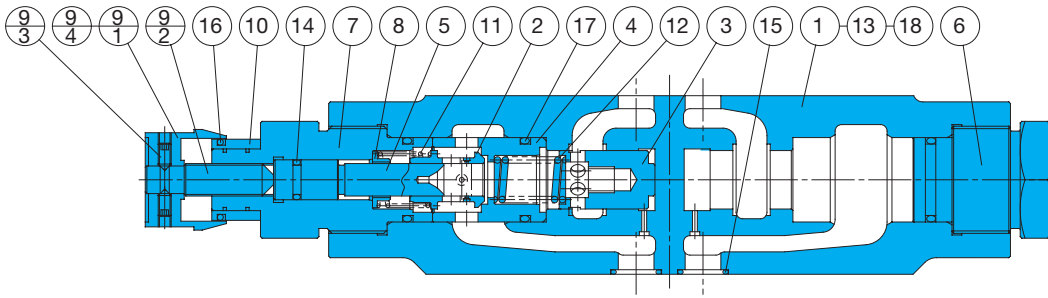
Seal Part List (Kit Model Number BFES-03FP)

Part No.	Part Name	Part Number	Q'ty	
			W	A
6.s	O-ring	NBR-70-1 P7	1	
11	O-ring	AS568-014(NBR-90)	5	
12	O-ring	NBR-90 P12	2	
13	O-ring	NBR-70-1 P21	1	
14	O-ring	NBR-90 P26	1	

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name
1	Body
2	Cover
3	Piston
4	Sleeve
5	Retainer
6	Screw kit
6.1	Knob
6.2	Screw
6.3	Screw
6.4	Screw
6.5	O-ring
7	Dial
8	Spring
9	Plate
10	Screw
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Pin

OCF-G03-A60-Y-J50



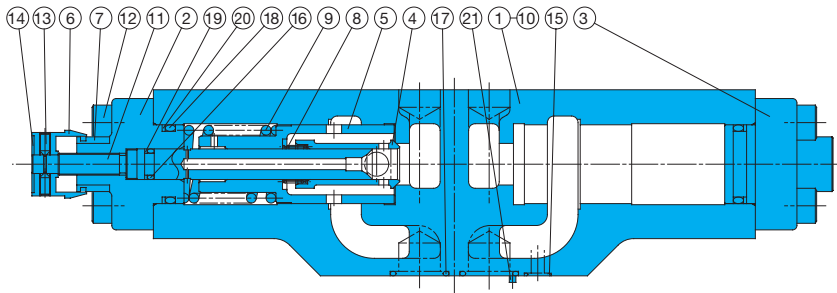
Part No.	Part Name
1	Body
2	Throttle
3	Piston
4	Sleeve
5	Rod
6	Bushing
7	Retainer
8	Guide
9	Screw kit
9-1	Knob
9-2	Screw
9-3	Screw
9-4	Screw
10	Dial
11	Spring
12	Spring
13	Plate
14	O-ring
15	O-ring
16	O-ring
17	O-ring
18	Pin

Seal Part List (Kit Model Number BFES-03CF*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
14	O-ring	NBR-70-1 P10	2	1	1
15	O-ring	AS568-014(NBR-90)	5	5	5
16	O-ring	NBR-70-1 P21	2	1	1
17	O-ring	NBR-90 P22	4	3	3

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify W, A, or B for the asterisk (*) in the kit model number.

OFH-G04-A200-Y-10



Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Throttle
5	Piston
6	Knob
7	Dial
8	Spring
9	Spring
10	Plate
11	Screw
12	Screw
13	Screw
14	Screw
15	O-ring
16	O-ring
17	O-ring
18	O-ring
19	Backup ring
20	Backup ring
21	Pin

Seal Part List (Kit Model Number BFKS-04CF*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
15	O-ring	AS568-012(NBR-90)	2	2	2
16	O-ring	NBR-90 P10A	2	1	1
17	O-ring	AS568-118(NBR-90)	4	4	4
18	O-ring	NBR-90 P30	2	2	2
19	Backup ring	T2-P10A	2	1	1
20	Backup ring	T2-P30	2	2	2

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Backup ring indicates JIS B 2407-T2-**.
 3. Specify W, A, or B for the asterisk (*) in the kit model number.



Check Modular Valve

50 to 300ℓ/min
25,35MPa

Features

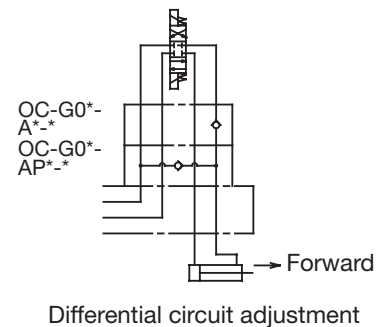
- ① This modular valve is a check valve that prevents reverse-flow.
- ② The 01, 03, 04 sizes include types that can also be used as suction and differential circuits.
- ③ Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Cracking pressure MPa(kgf/cm ²)	Weight kg	Gasket Surface Dimensions	
OC-G01-P1-21 P2 P3	1/8	25 {255}	50	0.04 {0.4}	1.0	ISO 4401-03-02-0-05	
0.35 {3.6}							
0.50 {5.1}							
OC-G01-T1-21 T2 T3				0.04 {0.4}			1.0
0.35 {3.6}							
0.50 {5.1}							
OC-G01-A1-21 A2 A3	0.04 {0.4}	1.2					
0.35 {3.6}							
0.50 {5.1}							
OC-G01-AP1-20 AP2 AP3	0.04 {0.4}		1.0				
0.35 {3.6}							
0.50 {5.1}							
OCV-G01-W-20	0.015 {0.15}	1.0					
OC-G03-P1-J50 P2 P3	3/8			25 {255}	100	0.04 {0.4}	2.7
0.35 {3.6}							
0.50 {5.1}							
OC-G03-T1-J50 T2 T3			0.04 {0.4}			2.7	
0.35 {3.6}							
0.50 {5.1}							
OC-G03-A1-J50 A2 A3	0.04 {0.4}	2.7					
0.35 {3.6}							
0.50 {5.1}							
OC-G03-AP1-J50 AP2 AP3	0.04 {0.4}		2.7				
0.35 {3.6}							
0.50 {5.1}							
OCV-G03-W-J50	0.015 {0.15}	3.5					
OCH-G04-P1-10 P2 P3	1/2			35 {357}	300	0.04 {0.4}	4.5
0.35 {3.6}							
0.50 {5.1}							
OCH-G04-T1-10 T2 T3			0.04 {0.4}			6.5	
0.35 {3.6}							
0.50 {5.1}							
OCH-G04-A1-10 A2 A3	0.04 {0.4}	4.5					
0.35 {3.6}							
0.50 {5.1}							
OCH-G04-AP1-10 AP2 AP3	0.04 {0.4}		4.5				
0.35 {3.6}							
0.50 {5.1}							
OVH-G04-W-10	0.01 {0.1}	6.5					

● Handling

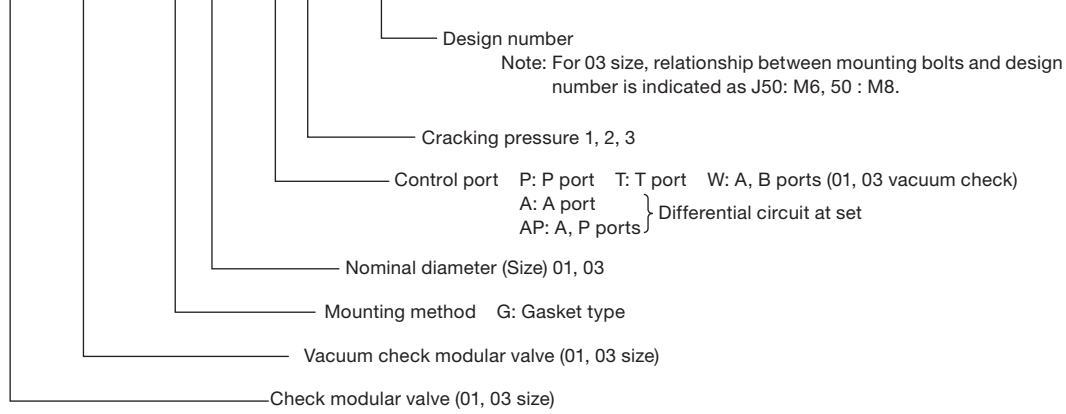
- ① Differential circuit can be easily configured at P → B by attaching OC-G**-A* above the OC-G**-AP* on the subplate. (See the figure to the right.)
- ② Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ③ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).



Explanation of model No.

01, 03 size

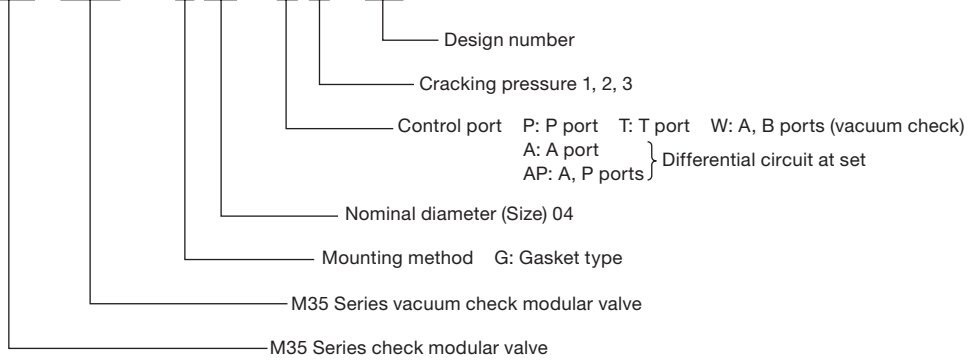
OC (OCV) - G 03 - P 1 - J50



Explanation of model No.

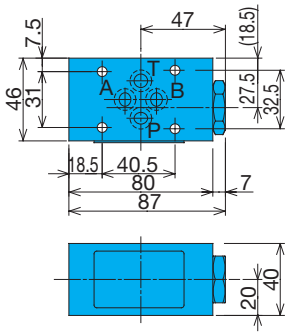
04 size

OCH (OVH) - G 04 - P 1 - 10

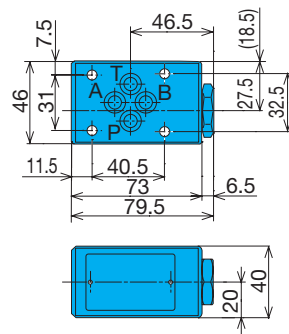


Installation Dimension Drawings

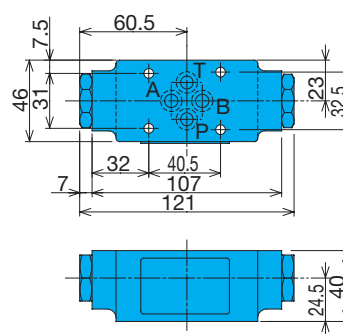
OC-G01-AP-20



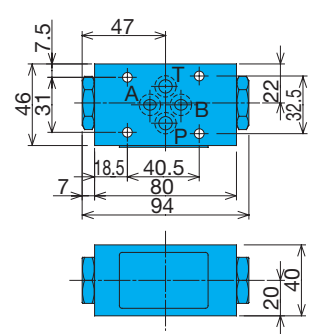
OC-G01-P_T*-21



OC-G01-A*-21

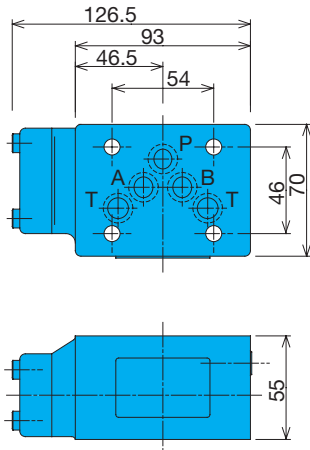


OCV-G01-W-20

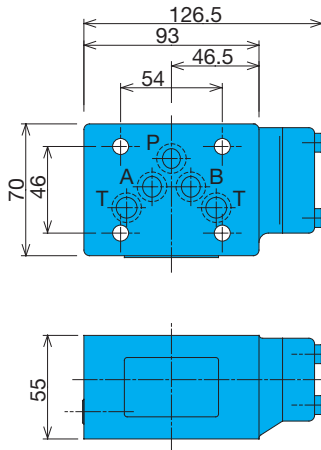


Note) Dimensions in the parentheses are for the OC-G01-T*-20.

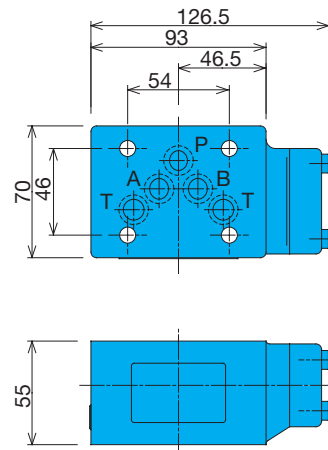
OC-G03-P_{AP}*-J50



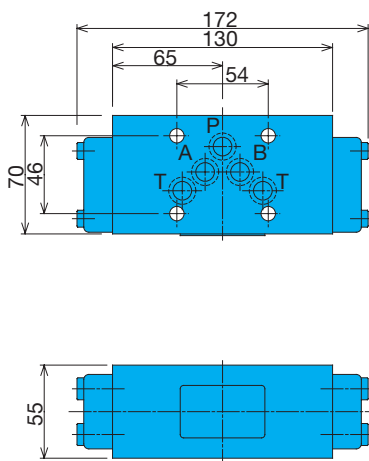
OC-G03-A*-J50



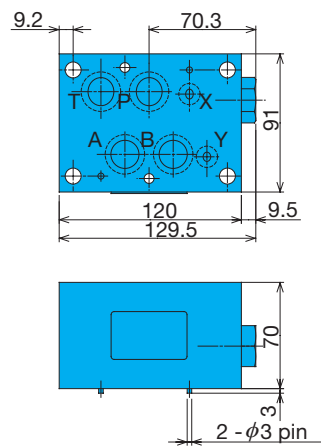
OC-G03-T*-J50



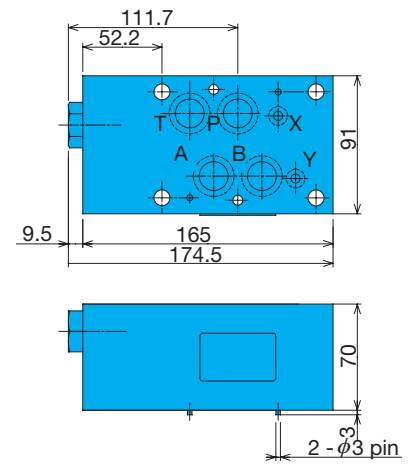
OCV-G03-W-J50



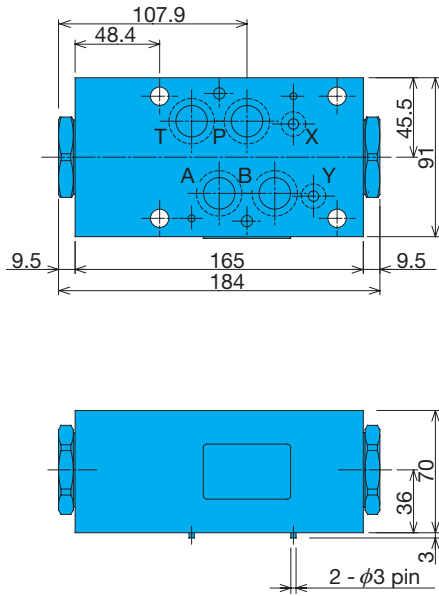
OCH-G04-A*-10
AP



OCH-G04-T*-10



OVH-G04-W-10

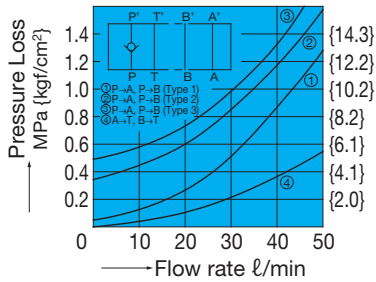


Performance Curves

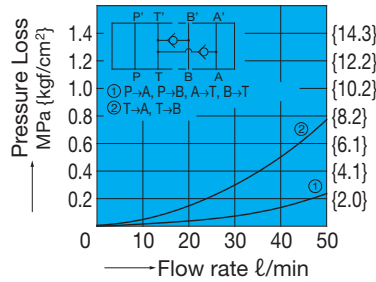
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

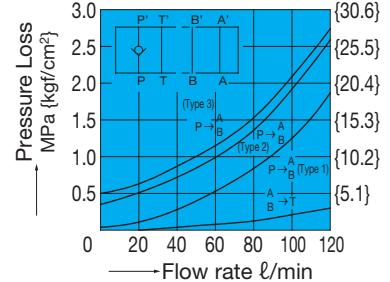
OC-G01-P*-21



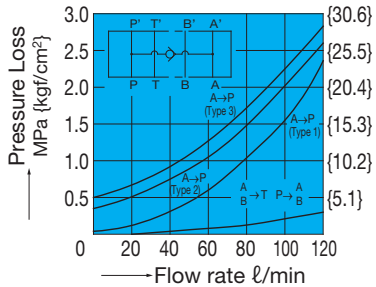
OCV-G01-W-20



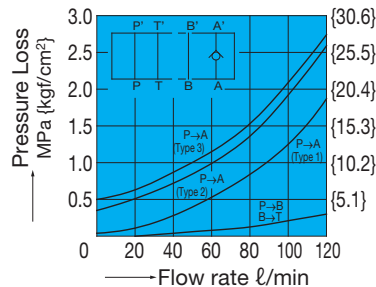
OC-G03-P*-J50



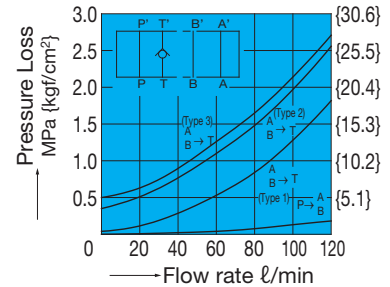
OC-G03-AP*-J50



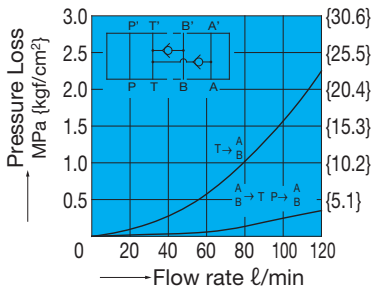
OC-G03-A*-J50



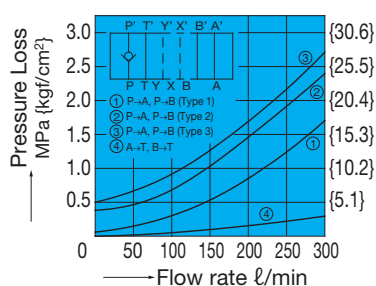
OC-G03-T*-J50



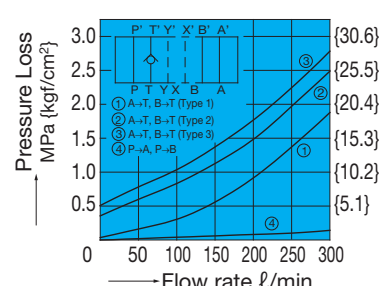
OCV-G03-W-J50



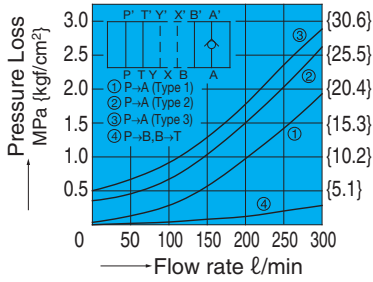
OCH-G04-P*-10



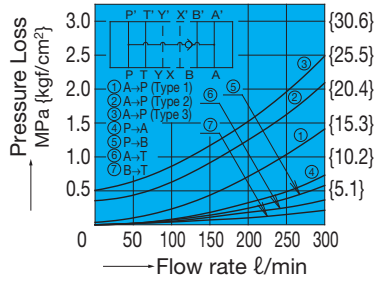
OCH-G04-T*-10



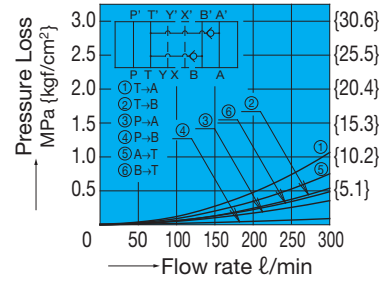
OCH-G04-A*-10



OCH-G04-AP*-10

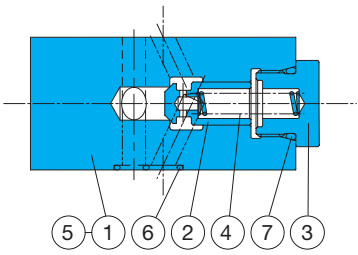


OVH-G04-W-10



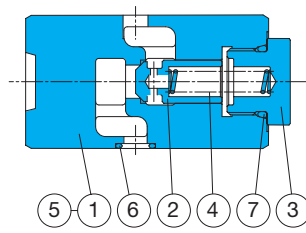
Cross-sectional Drawings

OC-G01-AP-20



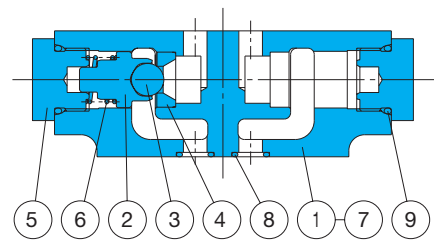
Part No.	Part Name
1	Body
2	Poppet
3	Spring seat
4	Spring
5	Plate
6	O-ring
7	O-ring

OC-G01-P* -21



Part No.	Part Name
1	Body
2	Poppet
3	Spring seat
4	Spring
5	Plate
6	O-ring
7	O-ring

OC-G01-A*-21



Part No.	Part Name
1	Body
2	Poppet
3	Ball
4	Seat
5	Spring seat
6	Spring
7	Plate
8	O-ring
9	O-ring

Seal Part List (Kit Model Number BDBS-01C*-0A)

Part No.	Part Name	Part Number	Q'ty		
			P	T	AP
6	O-ring	AS568-012(NBR-90)	4	4	4
7	O-ring	NBR-90 P18	1	1	1

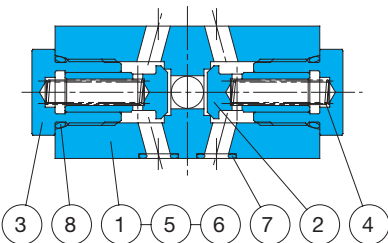
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify P, T, or AP for the asterisk (*) in the kit model number.

Seal Part List (Kit Model Number BDBS-01CA-0A)

Part No.	Part Name	Part Number	Q'ty
			A
8	O-ring	AS568-012(NBR-90)	4
9	O-ring	NBR-90 P18	2

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCV-G01-W-20



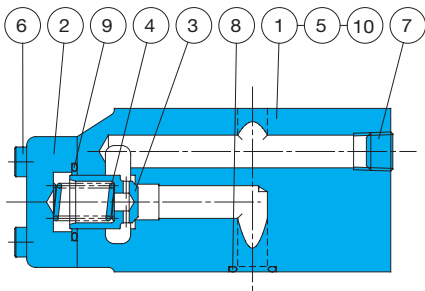
Part No.	Part Name
1	Body
2	Poppet
3	Guide
4	Spring
5	Plate
6	Plug
7	O-ring
8	O-ring

Seal Part List (Kit Model Number BDBS-01CVW)

Part No.	Part Name	Part Number	Q'ty
			W
7	O-ring	AS568-012(NBR-90)	4
8	O-ring	NBR-90 P18	2

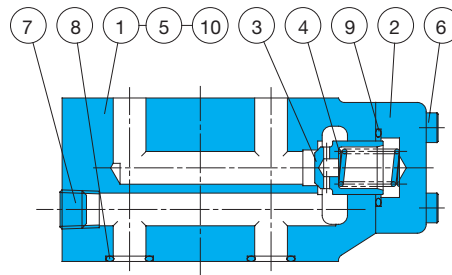
Note) The materials and hardness of the O-ring conform with JIS B2401.

OC-G03-P*-J50



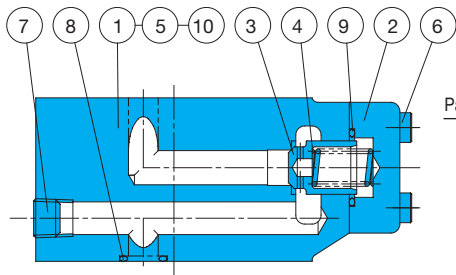
Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Spring
5	Plate
6	Screw
7	Plug
8	O-ring
9	O-ring
10	Pin

OC-G03-T*-J50



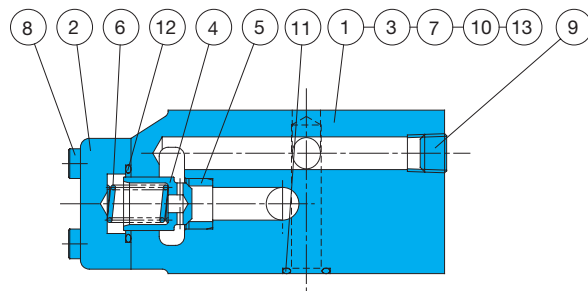
Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Spring
5	Plate
6	Screw
7	Plug
8	O-ring
9	O-ring
10	Pin

OC-G03-A*-J50



Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Spring
5	Plate
6	Screw
7	Plug
8	O-ring
9	O-ring
10	Pin

OC-G03-AP*-J50



Part No.	Part Name
1	Body
2	Cover
3	Plug
4	Poppet
5	Seat
6	Spring
7	Plate
8	Screw
9	Plug
10	O-ring
11	O-ring
12	O-ring
13	Pin

Seal Part List (Kit Model Number BDES-03C*)

Part No.	Part Name	Part Number	Q'ty		
			P	T	A
8	O-ring	AS568-014(NBR-90)	5	5	5
9	O-ring	NBR-90 P22	1	1	1

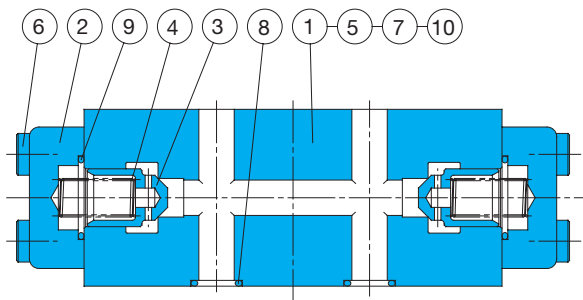
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify P, T, or A for the asterisk (*) in the kit model number.

Seal Part List (Kit Model Number BDES-03CAP)

Part No.	Part Name	Part Number	Q'ty
			AP
10	O-ring	NBR-90 P11	1
11	O-ring	AS568-014(NBR-90)	5
12	O-ring	NBR-90 P22	1

Note) The materials and hardness of the O-ring conform with JIS B2401.

OCV-G03-W-J50

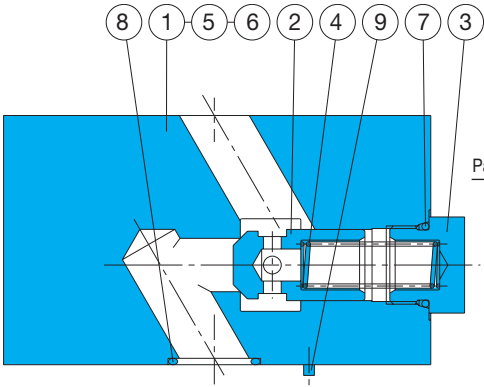


Seal Part List (Kit Model Number BDES-03CVW)

Part No.	Part Name	Part Number	Q'ty
			W
7	O-ring	NBR-90 P10A	2
8	O-ring	AS568-014(NBR-90)	5
9	O-ring	NBR-90 P22	2

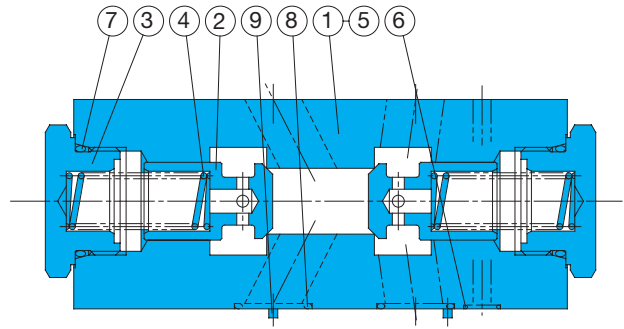
Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	5	Plate	9	O-ring
2	Cover	6	Screw	10	Pin
3	Poppet	7	O-ring		
4	Spring	8	O-ring		

OCH-G04-P*-10



Part No.	Part Name
1	Body
2	Poppet
3	Spring seat
4	Spring
5	Plate
6	O-ring
7	O-ring
8	O-ring
9	Pin

OVH-G04-W-10



Part No.	Part Name
1	Body
2	Poppet
3	Spring seat
4	Spring
5	Plate
6	O-ring
7	O-ring
8	O-ring
9	Pin

Seal Part List (Kit Model Number BDKS-04C*)

Part No.	Part Name	Part Number	Q'ty			
			P	T	A	AP
6	O-ring	AS568-012(NBR-90)	2	2	2	2
7	O-ring	NBR-90 P20	1	1	1	1
8	O-ring	AS568-118(NBR-90)	4	4	4	4

Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify P, T, A, or AP for the asterisk (*) in the kit model number.

Seal Part List (Kit Model Number BDKS-04CVW)

Part No.	Part Name	Part Number	Q'ty
6	O-ring	AS568-012(NBR-90)	2
7	O-ring	NBR-90 P32	2
8	O-ring	AS568-118(NBR-90)	4

Note) The materials and hardness of the O-ring conform with JIS B2401.



Pilot Operated Check Modular Valve

50 to 300ℓ/min
25,35MPa

Features

- ① This modular valve is used to prevent actuator self-running and to maintain actuator position.
- ② Maximum Operating Pressure: 25, 35MPa {255, 357kgf/cm²}

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm ² }	Area Ratio			Weight kg	Gasket Surface Dimensions
					Pilot Piston	Check Valve Seat	Needle Valve Seat		
OCP-G01-W1-21 W2	1/8	25 {255}	50	0.2 {2.0}	1	0.37	-	1.2	ISO 4401-03-02-0-05
OCP-G01-A1-21 A2				0.5 {5.1}					
OCP-G01-B1-21 B2				0.2 {2.0}					
OCP-G01-W1-F-21 W2				0.5 {5.1}					
OCP-G01-A1-F-21 A2				0.2 {2.0}					
OCP-G01-B1-F-21 B2				0.5 {5.1}					
OCP-G03-W1-J50 W2	3/8	25 {255}	100	0.2 {2.0}	1	0.49	0.07	3.6	ISO 4401-05-04-0-05
OCP-G03-A1-J50 A2				0.5 {5.1}					
OCP-G03-B1-J50 B2				0.2 {2.0}					
OCP-G03-W1-D-J50 W2				0.5 {5.1}					
OCP-G03-A1-D-J50 A2				0.2 {2.0}					
OCP-G03-B1-D-J50 B2				0.5 {5.1}					
OPH-G04-W1-10 W2	1/2	35 {357}	300	0.2 {2.0}	1	0.50	0.07	6.8	ISO 4401-07-06-0-05
OPH-G04-A1-10 A2				0.5 {5.1}					
OPH-G04-B1-10 B2				0.2 {2.0}					
OPH-G04-W1-D-10 W2				0.5 {5.1}					
OPH-G04-A1-D-10 A2				0.2 {2.0}					
OPH-G04-B1-D-10 B2				0.5 {5.1}					

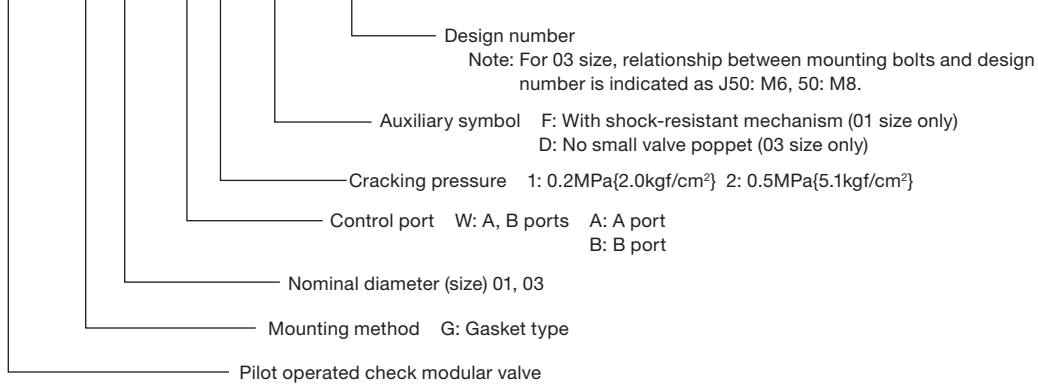
● Handling

- ① Note that when the 01 size has the auxiliary symbol "F," tank port back pressure can cause the small valve to open, making it impossible to maintain pressure.
- ② If tank port back pressure causes the small valve to open and make it impossible to maintain pressure with the 03, 04 size, use a direct type with auxiliary symbol "D."
- ③ Minimum pilot pressure fluctuates with the input side pressure during reverse flow. Operate the valve so pressure is at least twice as high as the required pressure obtained using the minimum pilot pressure characteristics graph.
- ④ Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.
- ⑤ 04 series modular valves do not have an L (DR₂) drain port, so they cannot be used in combination with pressure center type solenoid valves (D).

Explanation of model No.

01, 03 size

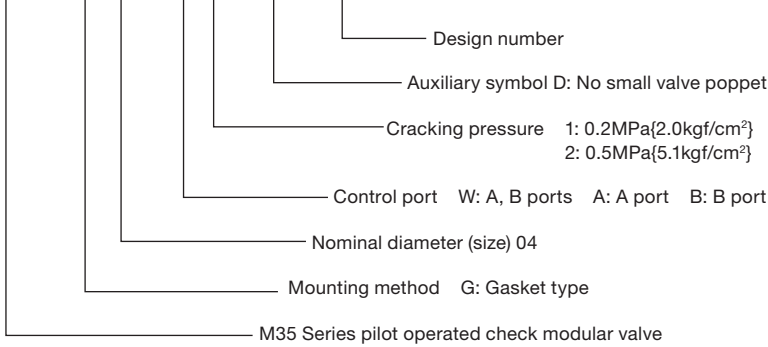
OCP - G 03 - W 1 - (D) - J50



Explanation of model No.

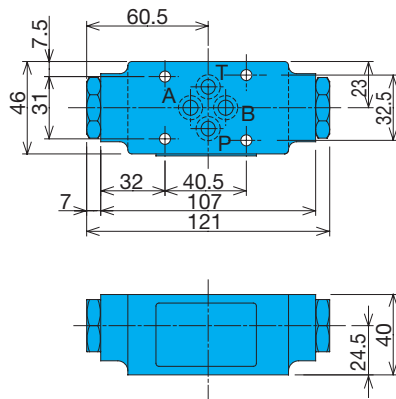
04 size

OPH - G 04 - W 1 - (D) - 10

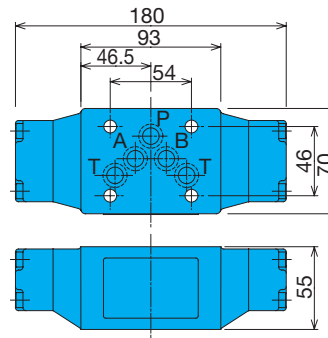


Installation Dimension Drawings

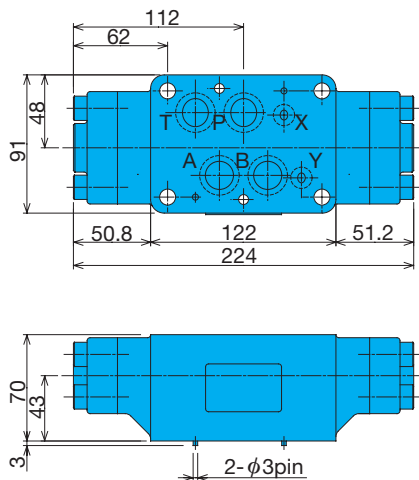
OCP-G01-**-F)-21



OCP-G03-**-D)-J50



OPH-G04-**-D)-10

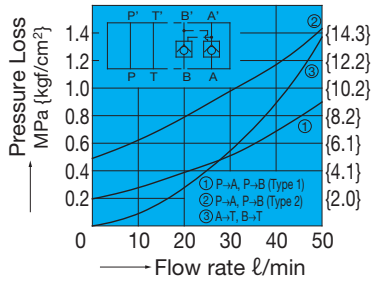


Performance Curves

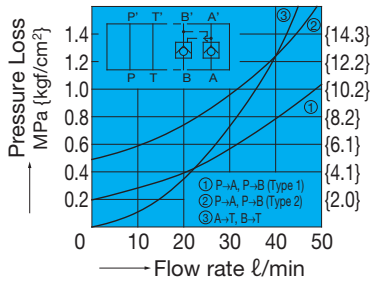
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

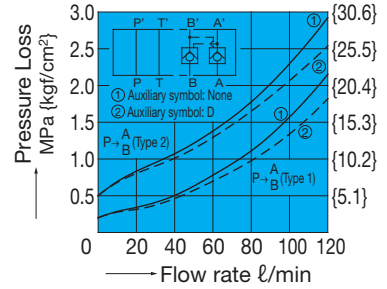
OCP-G01-W*-21



OCP-G01-W*-F-21

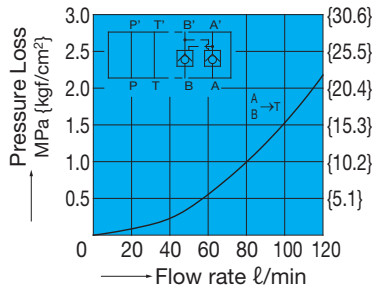


OCP-G03-W*-(D)-J50

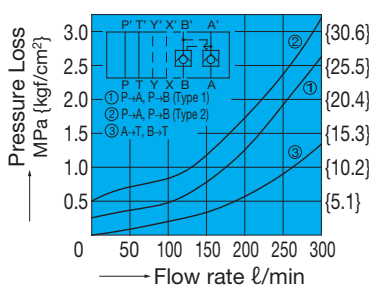


Pressure Loss Characteristics (Reverse Free Flow)

OCP-G03-W*-J50

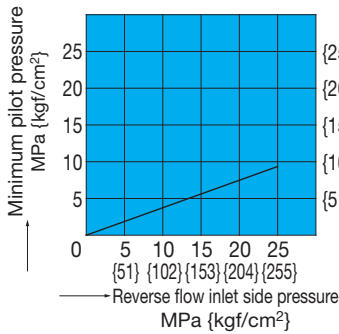


OPH-G04-W*-10

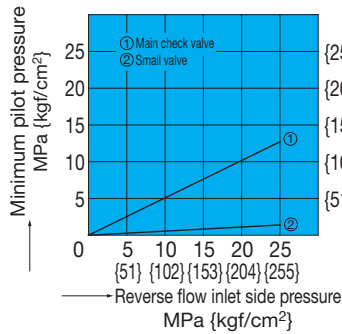


Minimum Pilot Pressure Characteristics

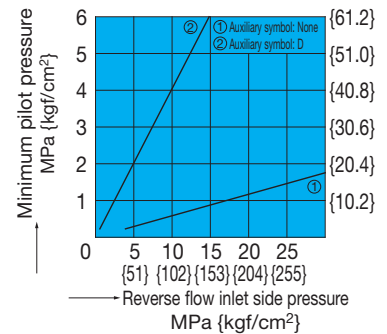
OCP-G01-**-21



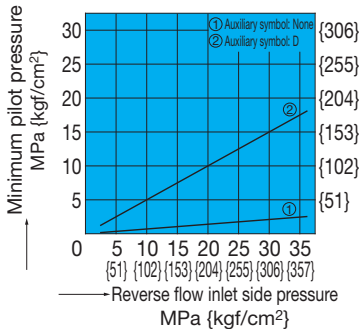
OCP-G01-**-F-21



OCP-G03-W*-(D)-J50

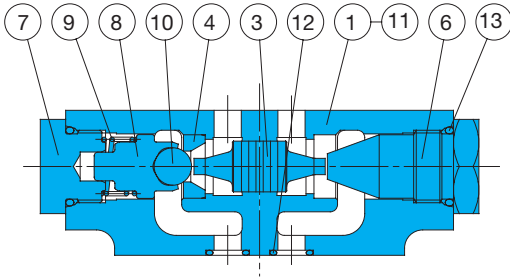


OPH-G04-W*-(D)-10

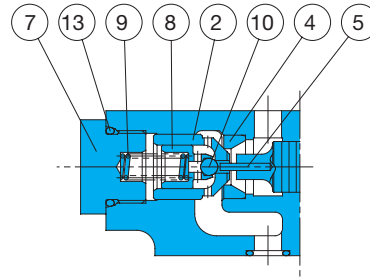


Cross-sectional Drawings

OCP-G01-A*-21



OCP-G01-A*-F-21



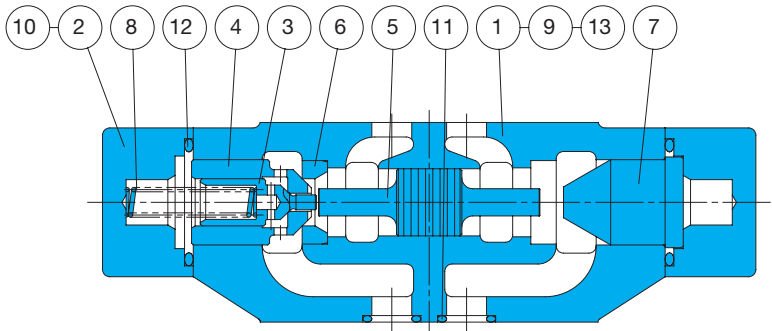
Part No.	Part Name
1	Body
2	Poppet
3	Piston
4	Seat
5	Rod
6	Bushing
7	Spring seat
8	Guide
9	Spring
10	Ball
11	Plate
12	O-ring
13	O-ring

Seal Part List (Kit Model Number BDBS-01CP*-0A)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	AS568-012(NBR-90)	4	4	4
13	O-ring	NBR-90 P18	2	2	2

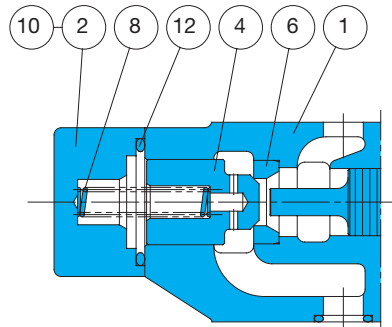
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify W, A, or B for the asterisk (*) in the kit model number.

OCP-G03-A*-J50



Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Poppet
5	Piston
6	Seat
7	Bushing
8	Spring
9	Plate
10	Screw
11	O-ring
12	O-ring
13	Pin

OCP-G03-**-D-J50

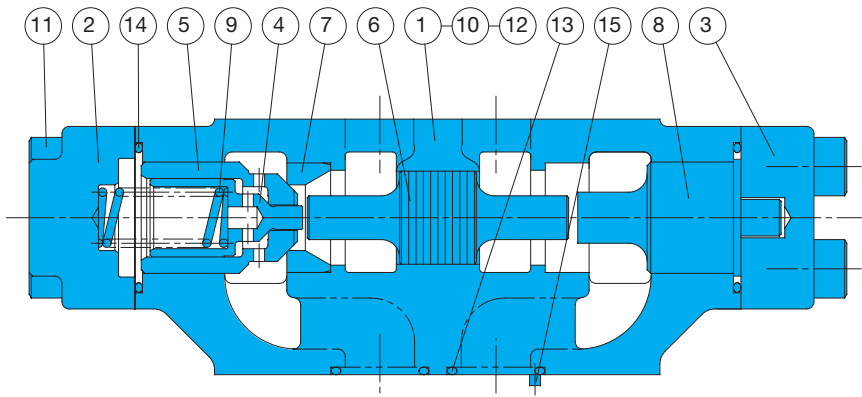


Seal Part List (Kit Model Number BDES-03CP*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
11	O-ring	AS568-014(NBR-90)	5	5	5
12	O-ring	NBR-90 P29	2	2	2

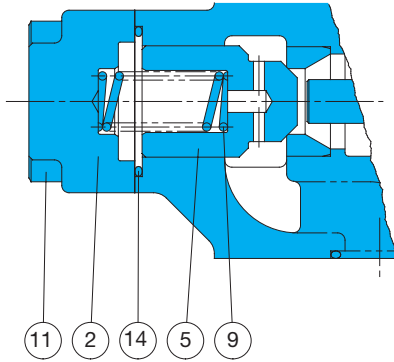
Note) 1. The materials and hardness of the O-ring conform with JIS B2401.
 2. Specify W, A, or B for the asterisk (*) in the kit model number.

OPH-G04-A*-10



Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Poppet
5	Poppet
6	Piston
7	Seat
8	Bushing
9	Spring
10	Plate
11	Screw
12	O-ring
13	O-ring
14	O-ring
15	Pin

OPH-G04-**-D-10



Seal Part List (Kit Model Number BDKS-04CP*)

Part No.	Part Name	Part Number	Q'ty		
			W	A	B
12	O-ring	AS568-012(NBR-90)	2	2	2
13	O-ring	AS568-118(NBR-90)	4	4	4
14	O-ring	AS568-127(NBR-90)	2	2	2

Note) Specify W, A, or B for the asterisk (*) in the kit model number.



Gauge Modular Block

50 to 100ℓ/min
25MPa

Features

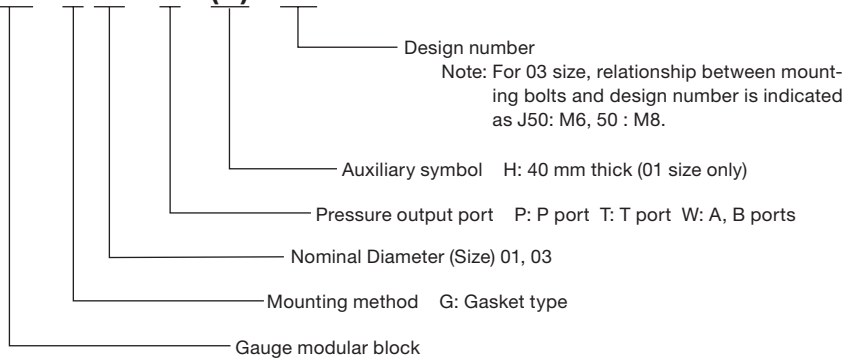
- ① This modular block makes it possible to attach a pressure gauge to the P and T ports or the A and B ports.
- ② Connection to the ports is extremely simple.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Weight kg	Gasket Surface Dimensions
OK-G01-P-20 OK-G01-T-20	1/8	25 {255}	50	0.6	ISO 4401-03-02-0-05
OK-G01-W-20				0.6	
OK-G01-P-H-20 OK-G01-T-H-20				1.0	
OK-G01-W-H-20				1.0	
OK-G03-J50	3/8	25 {255}	100	2.3	ISO 4401-05-04-0-05

Explanation of model No.

OK - G 01 - P - (H) - 20

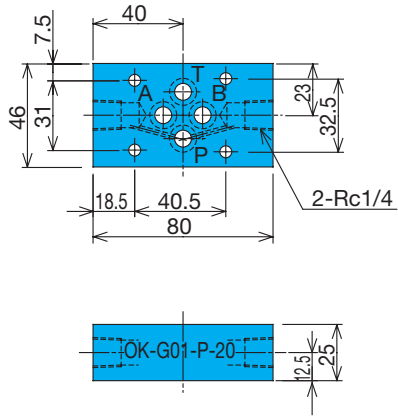


● Handling

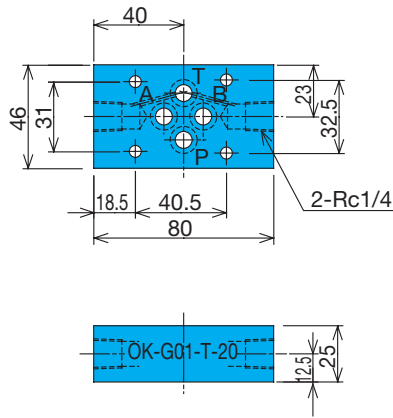
- ① When installing the OK-G01-P-(H)- 20, OK-G01-T-(H)-20, or OK-G01- W-(H)-20, make sure the model number printing is oriented so it can be read correctly from the P port side.
- ② Note that a sub plate and installation bolts are not included. See pages D-90 through D-95 if these items are required.

Installation Dimension Drawings

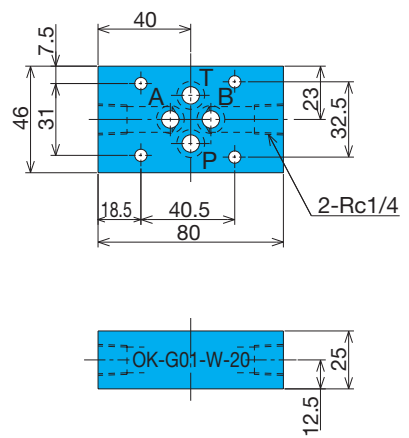
OK-G01-P-20



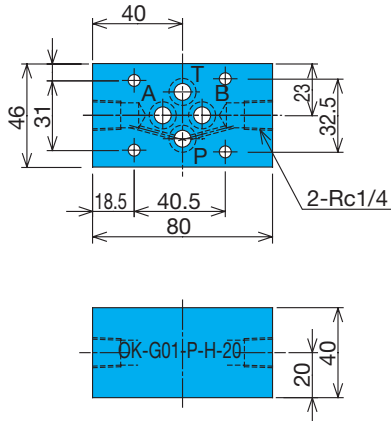
OK-G01-T-20



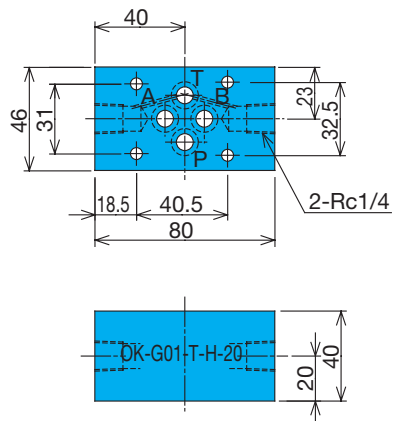
OK-G01-W-20



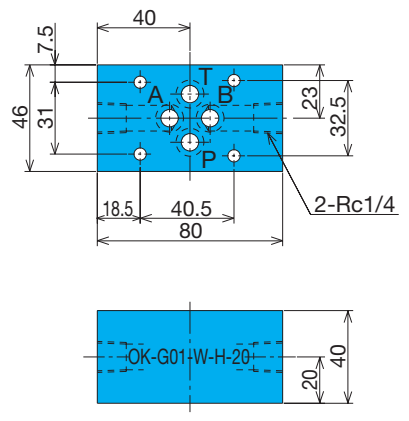
OK-G01-P-H-20



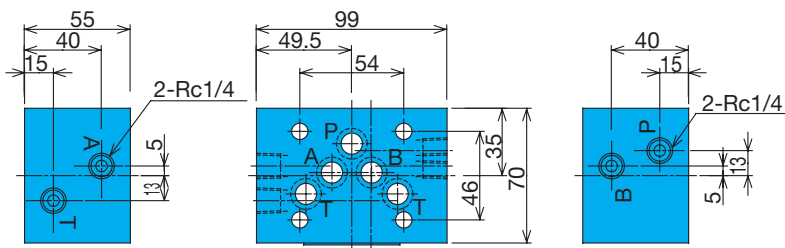
OK-G01-T-H-20



OK-G01-W-H-20



OK-G03-J50



Seal Part List

Size	Part Name	Part Number	Q'ty
01	O-ring	AS568-012(NBR-90)	4
03	O-ring	AS568-014(NBR-90)	5

Note) The materials and hardness of the O-ring conform with JIS B2401.



High-low System Block

50 to 100ℓ/min
25MPa

Features

Simple high-low 2-speed control can be attained by stacking this block on top of a high-low base block and manifold, which configures a speed control circuit.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Weight kg
OB-G01-W-20	1/8	25 {255}	50	1.5
OB-G01-W-H-20				2.5
OB-G03-W-J30	3/8	25 {255}	100	4.5
OB-G03-W-H-J30				7.1

●Handling

① If a base block is required, use MOB-01Y-W*-10 for the 01 size and MOB-03X-B*-J30 for the 03 size, because their valve pitches match. MOB-01X-B*-10 has a different valve pitch, and so cannot be used.

② When installing this block, make sure the nameplate is oriented so it can be read correctly from the A port side.

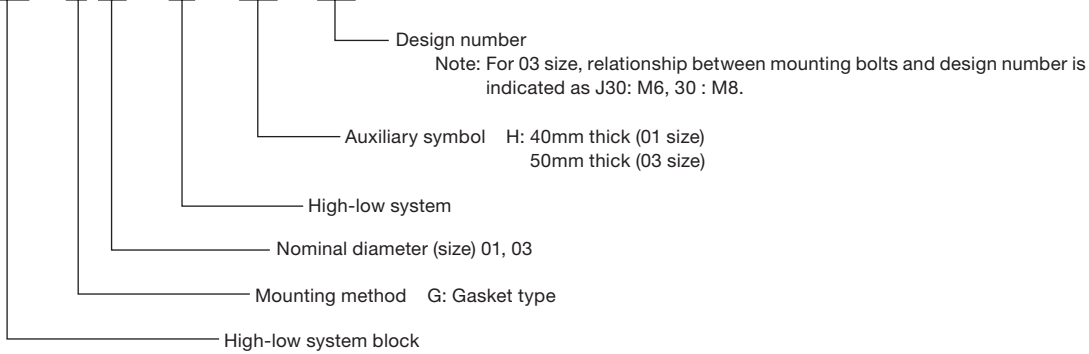
③ Both of the cylinder ports on this block's manifold side (bottom) are open. Because of this, close one of the base block cylinder ports (A1, B1

or A2, B2 on the next page), or modify the manifold so it has a single cylinder port only.

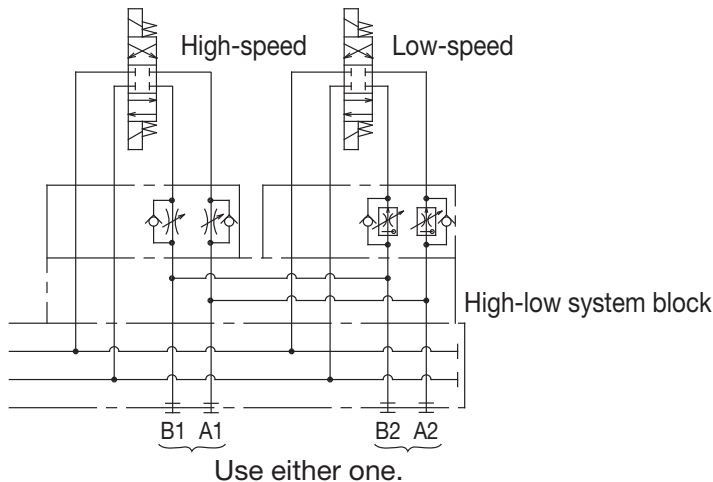
④ Note that installation bolts are not included. See pages D-90 through D-95 if these items are required.

Explanation of model No.

OB - G 01 - W - (H) - 20

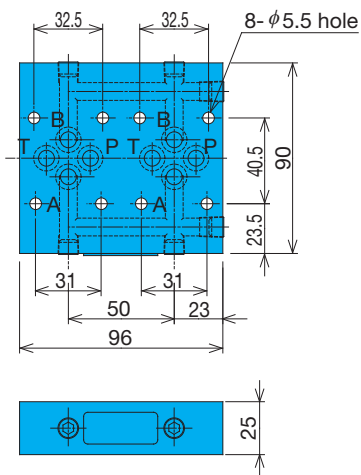


Example of Typical Circuit

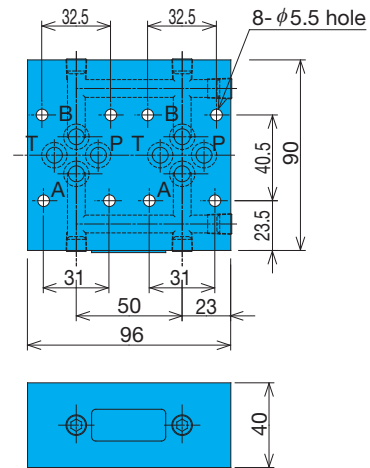


Installation Dimension Drawings

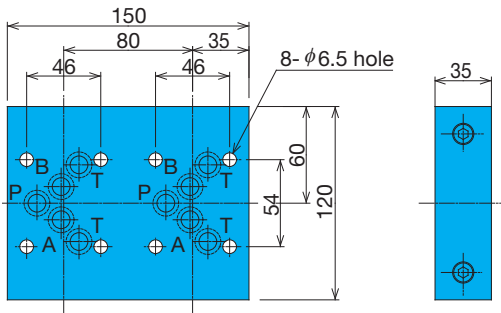
OB-G01-W-20



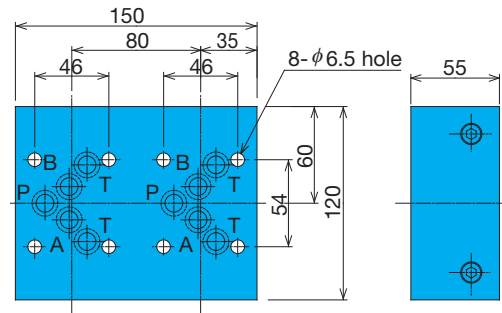
OB-G01-W-H-20



OB-G03-W-J30



OB-G03-W-H-J30



Seal Part List

Size	Part Name	Part Number	Q'ty
01	O-ring	AS568-012(NBR-90)	8
03	O-ring	NBR-90 P12	10

Note) The materials and hardness of the O-ring conform with JIS B2401.

End Plate, Free Flow Plate, 03/01 Change Plate

50 to 100ℓ/min
25MPa

Features

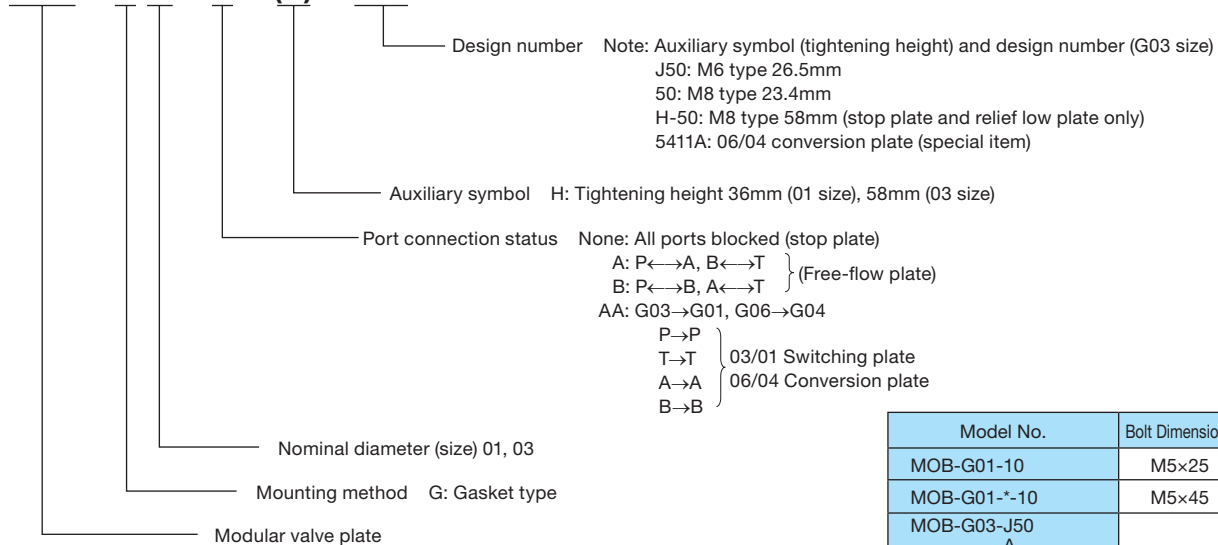
- ① The end plate is a modular valve plate used to close off a circuit that is not required, and when using a relief modular valve in a standalone configuration.
- ② The free flow plate is a modular valve plate is used in a one-way circuit that does not require a solenoid valve.
- ③ The 03/01 change plate makes it possible to use an 01 size modular valve with an 03 size sub-plate and base block.
- ④ The 06/04 change plate makes it possible to use an 04 size modular valve with an 06 size sub-plate and base block.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Weight kg
MOB-G01-10	1/8	25 {255}	-	0.3
MOB-G01-H-10			-	0.6
MOB-G01-A-10			50	0.6
MOB-G01-B-10			50	0.6
MOB-G03-J50	3/8	25 {255}	-	1.4
MOB-G03-H-50			-	2.5
MOB-G03-A-J50			100	1.3
MOB-G03-B-J50				1.3
MOB-G03-A-H-50			50	2.3
MOB-G03-B-H-50				2.3
MOB-G03-AA-J50	50	2.3		
MOB-G06-AA-5411A	3/4	21 {214}	200	8.0

Explanation of model No.

MOB - G 03 - A - (H) - J50



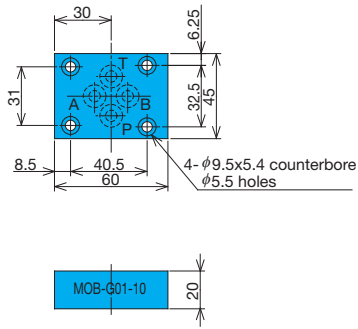
● Handling

- ① Installation bolts are not included. Use the table to the right to specify bolts for stand-alone use.

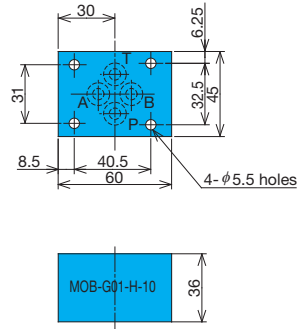
Model No.	Bolt Dimensions	Q'ty
MOB-G01-10	M5×25	4
MOB-G01- [*] 10	M5×45	4
MOB-G03-J50	M6×35	4
MOB-G03- ^A _B -J50		
MOB-G03-AA-J50		
MOB-G03-50	M8×35	4
MOB-G03- ^A _B -50		
MOB-G03-AA-50		
MOB-G03-H-50	M8×70	4
MOB-G03- ^A _B -H-50		
MOB-G06-AA-5411A	M12×70	6

Installation Dimension Drawings

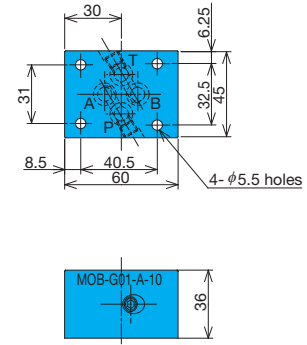
MOB-G01-10



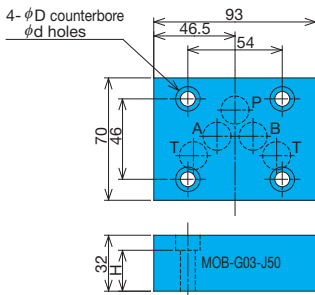
MOB-G01-H-10



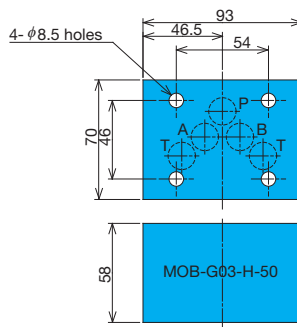
MOB-G01-A(B)-10



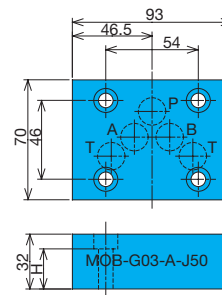
MOB-G03-J50



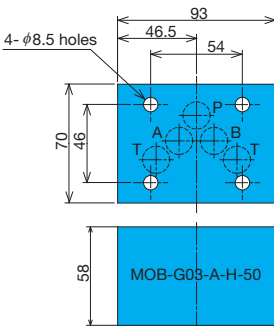
MOB-G03-H-50



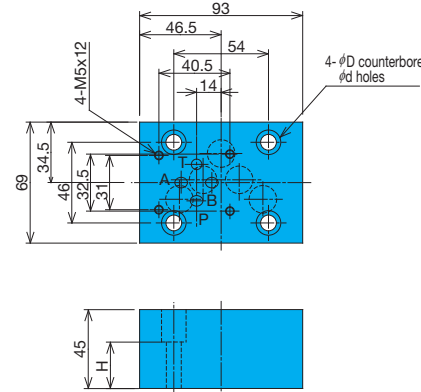
MOB-G03-A(B)-J50



MOB-G03-A(B)-H-50



MOB-G03-AA-J50



Model No.	D	H	d
MOB-G03-*-50	14	23.4	8.5
MOB-G03-*-J50	11	26.5	6.5

Seal Part List

Size	Part Name	Part Number	Q'ty
01	O-ring	AS568-012(NBR-90)	4
03	O-ring	AS568-014(NBR-90)	5
06	O-ring	NBR-90 P28	4
	O-ring	NBR-90 P20	2

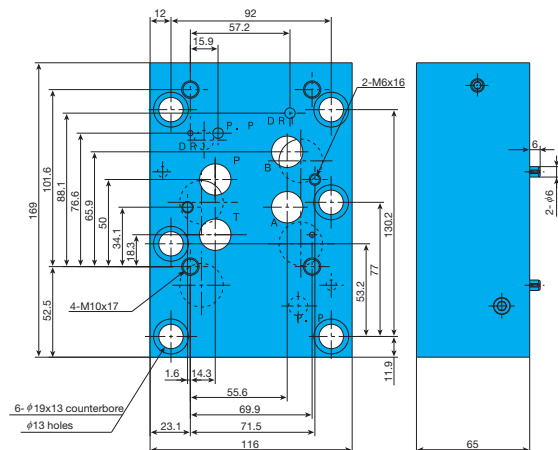
Note) The materials and hardness of the O-ring conform with JIS B2401.

Performance Curves

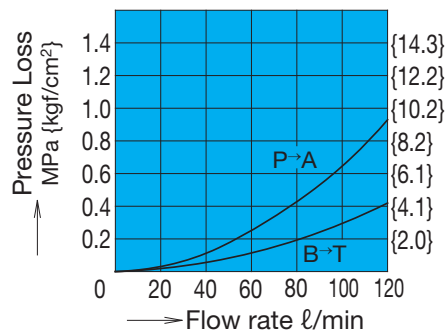
Hydraulic Operating Fluid
Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

MOB-G06-AA-5411A



MOB-G03-A-J50



Solenoid Valve/Modular Valve Subplate

Features

This plate is for when only a single solenoid valve and modular is used.

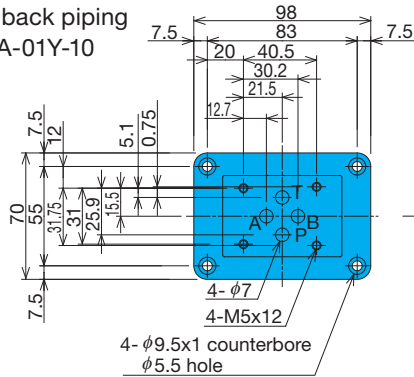
The 01 and 03 sizes include one-side piping types.

Installation Dimension Drawings

Use the following table for specification when a sub plate is required.

01 (nominal diameter)

For back piping
MSA-01Y-10

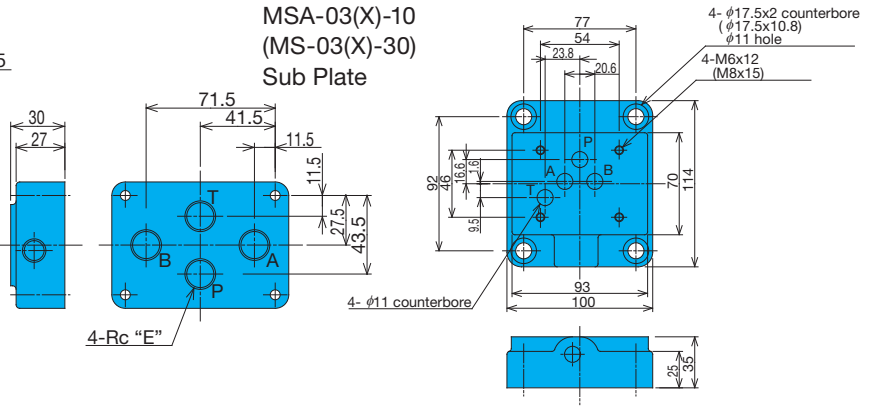


Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate ℓ/min	Weight kg
MSA-01X-10	1/4	25	20	1.2
MSA-01Y-10	3/8	{255}	40	1.2

03 (nominal diameter)

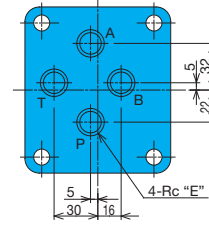
For back piping

MSA-03(X)-10
(MS-03(X)-30)
Sub Plate



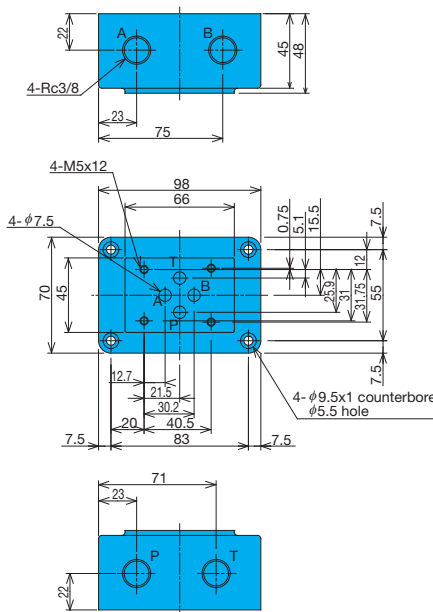
Sub Plate Number

Mounting bolt	Model No.	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate ℓ/min	E
M6	MSA-03-10	25	45	3/8
	MSA-03X-10	{255}	80	1/2
M8	MS-03-30	25	45	3/8
	MS-03X-30	{255}	80	1/2



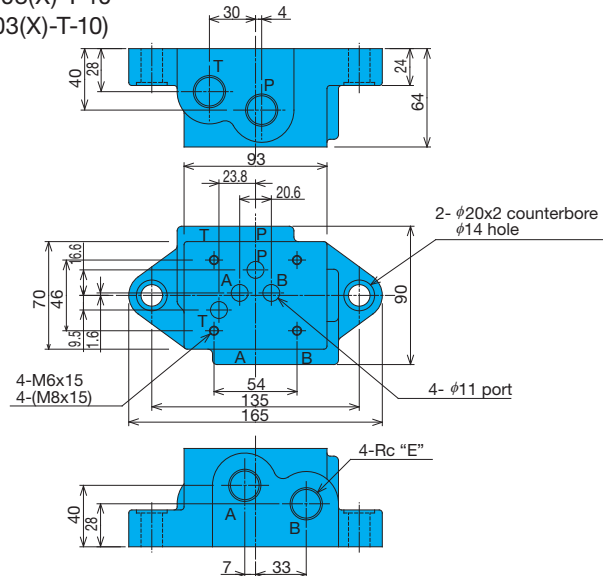
Note) Dimensions in parentheses indicate MS-03 (X) -30.

For one-side piping
MSA-01Y-T-10



Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate ℓ/min	Weight kg
MSA-01Y-T-10	3/8	25 {255}	40	1.9

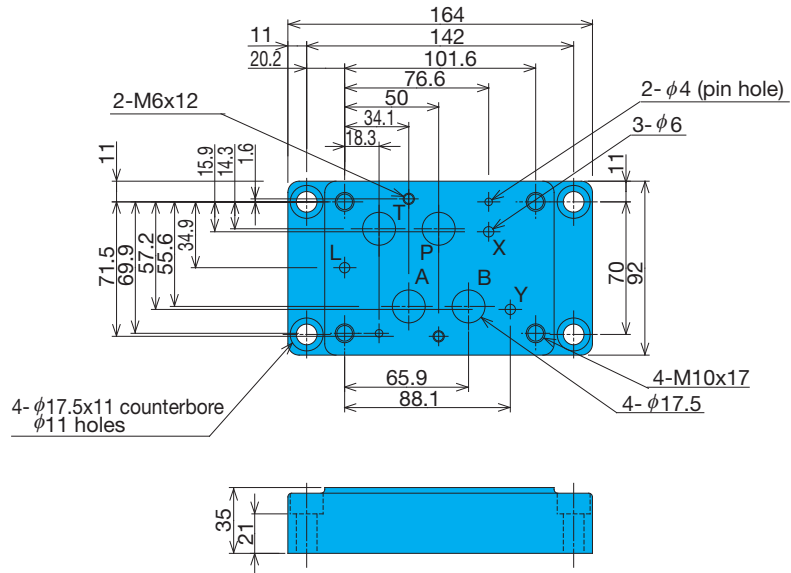
For one-side piping
MSA-03(X)-T-10
(MS-03(X)-T-10)



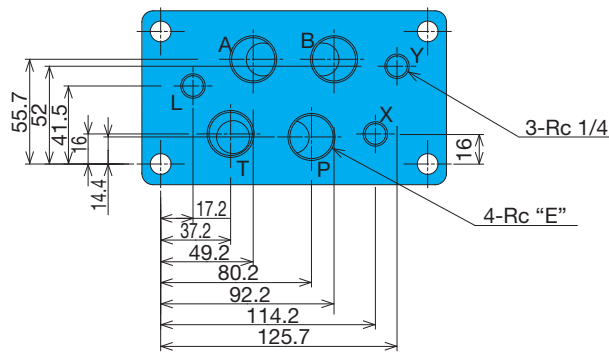
Note) Dimensions in parentheses indicate MS-03 (X) -T-10.

Mounting bolt	Model No.	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate ℓ/min	Pipe Outlet Size E	Weight kg
M6	MSA-03-T-10	25 {255}	45	3/8	3.8
	MSA-03X-T-10		80	1/2	
M8	MS-03-T-10	25 {255}	45	3/8	3.8
	MS-03X-T-10		80	1/2	

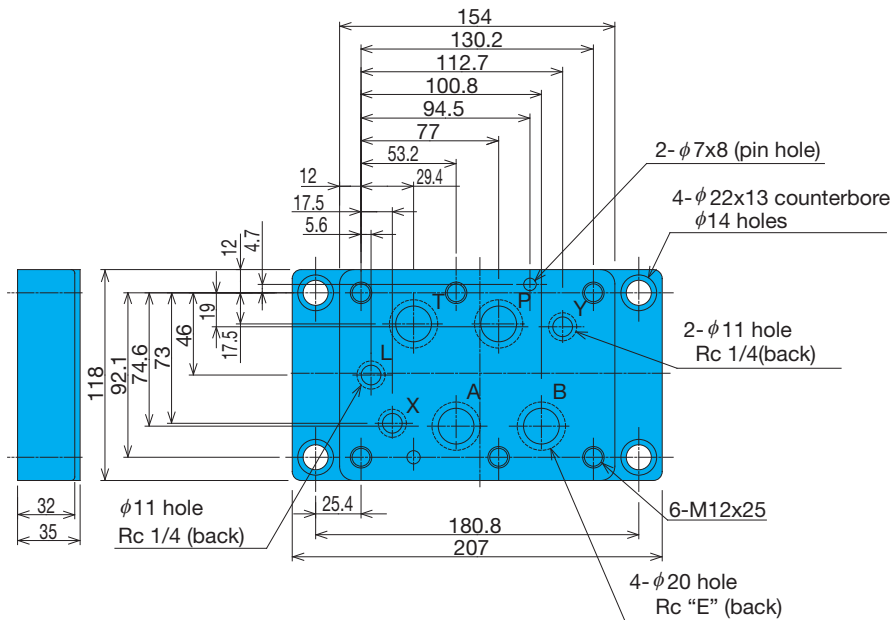
04 (nominal diameter)
MDS-04(X)-10



Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate ℓ/min	Weight kg
MDS-04-10	1/2	25 {255}	80	4.5
MDS-04X-10	3/4		150	



06 (nominal diameter)
MDS-06(X)-30 (for back piping)

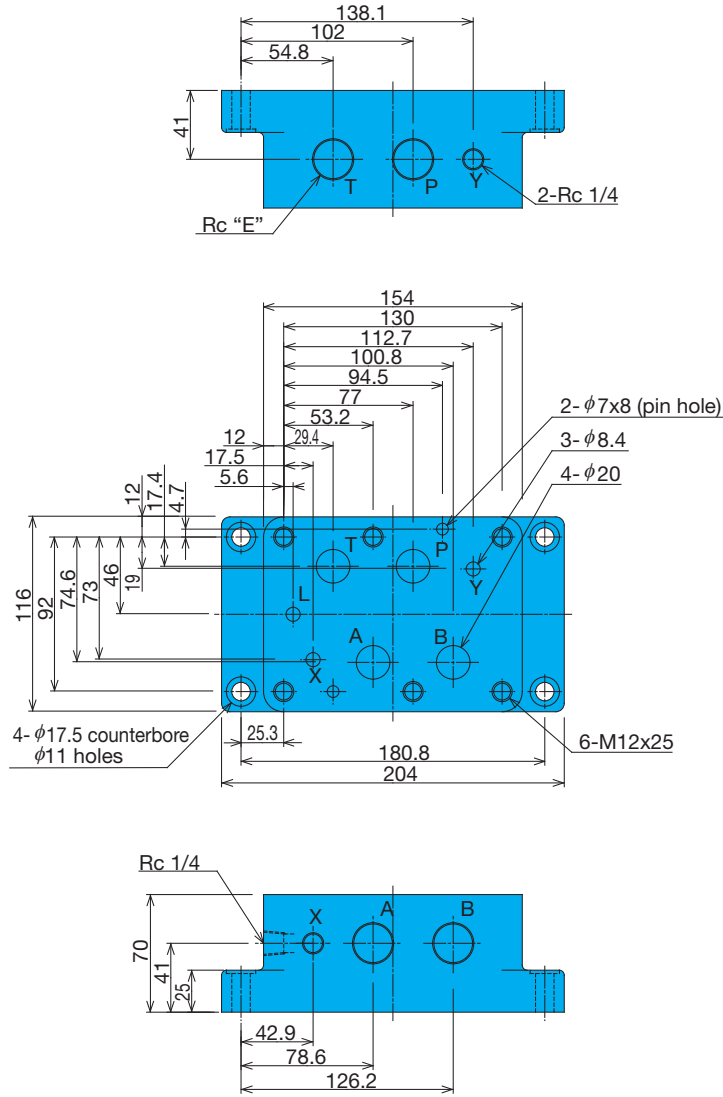


Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate ℓ/min	Weight kg
MDS-06-30	3/4	25 {255}	150	5.2
MDS-06X-30	1		300	

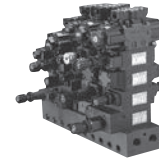
MDS-06(X)-T-10 (for one-side piping)

D

Modular Valve



Model No.	Pipe Outlet Size E	Maximum Working Pressure MPa(kg/cm ²)	Recommended Flow Rate l/min	Weight kg
MDS-06-T-10	3/4	25 {255}	150	9.0
MDS-06X-T-10	1		300	



Valve Installation Bolt List

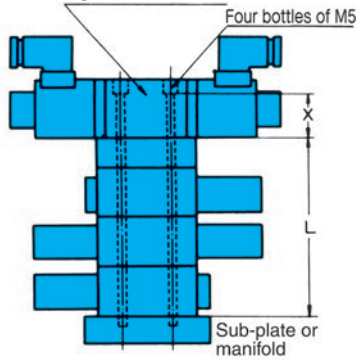
01 (nominal diameter)

SS-G01-***-**-31

SA-G01-***-**-31

SL-G01-***-**-40

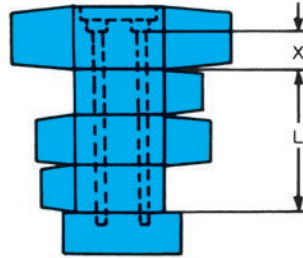
SE



03 (nominal diameter)

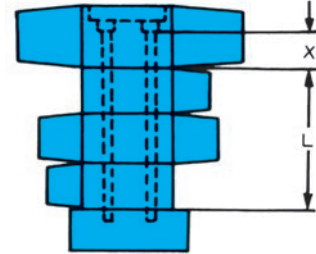
SS-G03-***-**-J22

SA-G03-***-**-J21



SS-G03-***-**-22

SA-G03-***-**-21



Model Number	X
SA-G01-***-**-31	37.5
SS-G01-***-R**-31	
SL-G01-***-R**-31	
SE-G01-***-GR**-40	

Model Number	X
SS-G03-***-R**-J22	60.5
SA-G03-***-R**-J21	

Model Number	X
SS-G03-***-R**-22	58
SA-G03-***-R**-21	

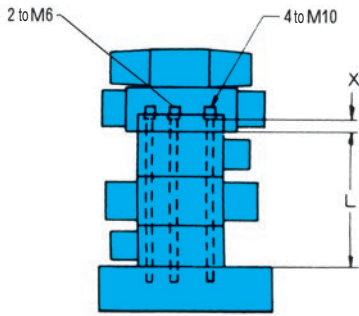
Type	Model Number	Dimension L	Bolt length
Hexagon Socket Head Bolt	OTH-01-45-10	0	45
	OTH-01-70-10	25	70
	85	40	85
	110	65	110
	125	80	125
	150	105	150
	165	120	165
	190	145	190
	205	160	205
Stat Bolt	OTD-01-80-10	25	80
	95	40	95
	120	65	120
	135	80	135
	145	90	145
	160	105	160
	175	120	175
	185	130	185
	200	145	200
	210	155	210
	215	160	215
	225	170	225
	240	185	240
	250	195	250
	265	210	265
275	220	275	

Type	Model Number	Dimension L	Bolt length
Hexagon Socket Head Bolt	OTH-03-125-J30	55	M6×125
	-180-	110	M6×180
Stat Bolt	OTD-03-135-J30	55	M6×135
	-170-	90	M6×170
	-190-	110	M6×190
	-225-	145	M6×225
	-245-	165	M6×245
	-280-	200	M6×280
	-300-	220	M6×300

Type	Model Number	Dimension L	Bolt length
Hexagon Socket Head Bolt	OTH-03-125-30	55	M8×125
	-180-	110	M8×180
Stat Bolt	OTD-03-135-30	55	M8×135
	-170-	90	M8×170
	-190-	110	M8×190
	-225-	145	M8×225
	-245-	165	M8×245
	-280-	200	M8×280
-300-	220	M8×300	

- Note) 1. Model numbers indicate bolt kits for one solenoid valve.
 2. Up to four modular valves can be ganged together.
 3. 01 Size
 Modular valves at a height of 40 + 25 = 65mm are ganged to one level.
 4. 2-pressure reducing valves at a height of 90 mm are ganged to two levels.
 5. Refer to page E-31 for installation bolts for SE-G03.

04 (nominal diameter)



D

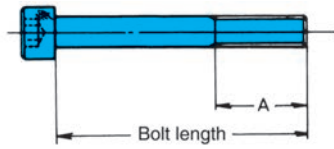
Modular Valve

Model No.	X
DSS-G04-***-R-**-22 DSA-G04-***-**-22	34

Type	Model Number	Dimension L	Bolt Size	Bolt length
Hexagon Socket Head Bolt	OTH-04-120-10	70	M6	115
			M10	120
	-135-	85	M6	130
			M10	135
	-190-	140	M6	185
			M10	190
	-205-	155	M6	200
			M10	205
Stat Bolt	OTD-04-135-10	70	M6	123
			M10	135
	-150-	85	M6	138
			M10	150
	-205-	140	M6	193
			M10	205
	-220-	155	M6	210
			M10	220
	-275-	210	M6	265
			M10	275
	-290-	225	M6	278
			M10	290

- Note) 1. The above model numbers indicate bolt kits for one solenoid valve.
 2. Up to three modular valves can be ganged together.
 3. There is a bolt for ganging four valves, but the maximum operating pressure is limited to 21 MPa. For details, consult your agent.
 (See page D-4)

Hexagon socket head bolt



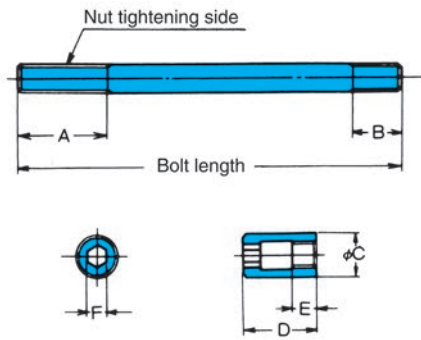
Nominal Diameter	A	Bolt Size
01	15	M5
03	18	M6
03	22	M8
04	18	M6
	26	M10

Dimensions other than bolt length are in accordance with JIS B 1176.

Tightening Torque

Nominal Diameter	Bolt Size	Tightening Torque N·m{kgf·cm}
01	M5	5 to 7 { 51 to 71 }
03	M6	10 to 13 {102 to 133}
03	M8	20 to 25 {205 to 255}
04	M6	10 to 13 {102 to 133}
	M10	45 to 55 {460 to 560}

Stat Bolts and Nuts



Model No.	A	B	C	D	E	F	Bolt Size
OTD-01-***-10	12	9	8.5	16	11	4	M5
OTD-03-***-J30	20	10	10	18	11.5	5	M6
OTD-03-***-30	25	12.5	13	22	15	6	M8
OTD-04-***-10	20	10	10	18	11.5	5	M6
	25	18	16	23	15	8	M10

Stat bolts and nuts are included. The E dimension is the effective screw depth.

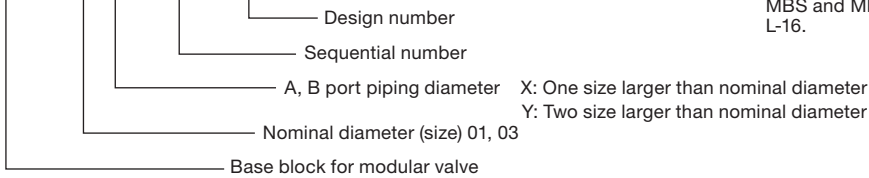
01, 03 Base Block

Features

This block, which allows piping from both sides, is designed for use with combinations of two or more solenoid valves and modular valves.

Explanation of model No.

MOB - 01X - B3 - 10

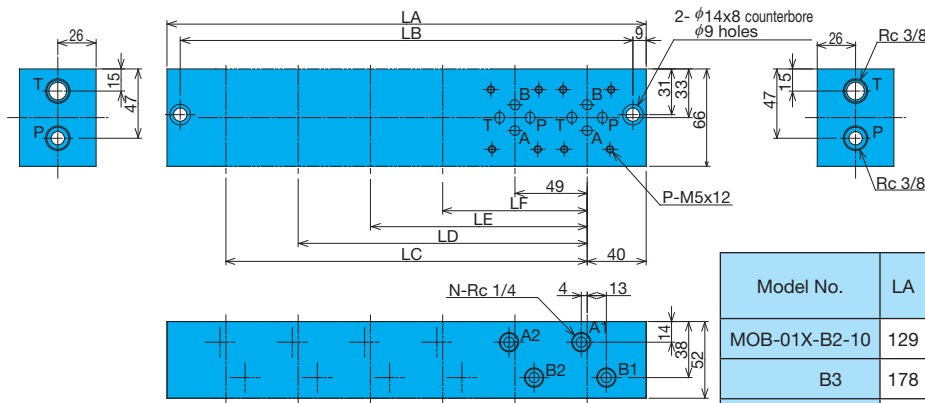


Note) Another series of multi-pump blocks is available for the MBS and MBW Series NACHI PACK. For details, see page L-16.

Installation Dimension Drawings

01 (nominal diameter) bass block

MOB-01X-B*-10



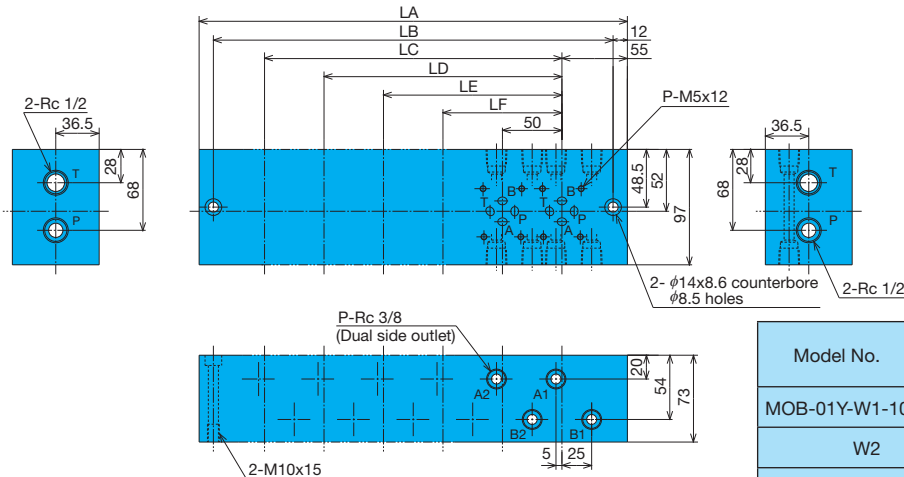
Plug Tightening Torque

Plug Configuration	Tightening Torque N·m(kgf·cm)
TPHA-1/4	25 to 30 {255 to 305}
TPHA-3/8	40 to 48 {410 to 490}

Model No.	Pipe Outlet Size (A, B)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min
MOB-01X-B*-10	1/4	25 {255}	20

Model No.	LA	LB	LC	LD	LE	LF	N	P	Weight kg
MOB-01X-B2-10	129	111	-	-	-	-	4	8	2.8
B3	178	160					6	12	3.8
B4	227	209					8	16	4.9
B5	276	258					10	20	5.9
B6	325	307	245	196	147	98	12	24	6.9

MOB-01Y-W*-10



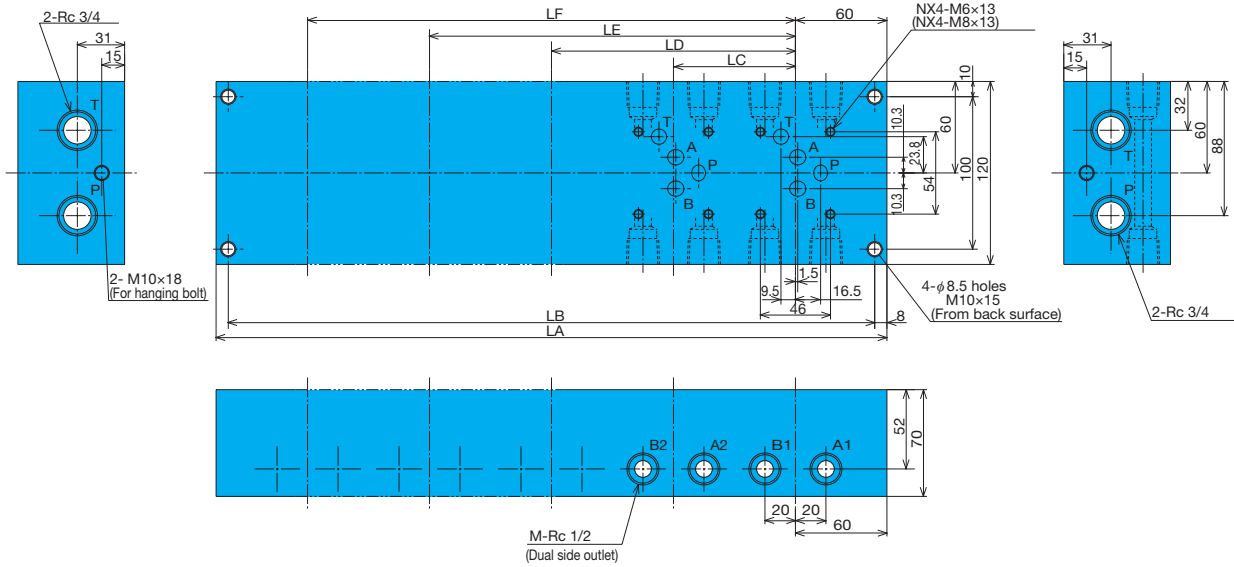
Plug Tightening Torque

Plug Configuration	Tightening Torque N·m(kgf·cm)
TPHA-3/8	40 to 48 {410 to 490}
TPHA-1/2	55 to 66 {560 to 675}

Model No.	Pipe Outlet Size (A, B)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min
MOB-01Y-W*-10	3/8	25 {255}	40

Model No.	LA	LB	LC	LD	LE	LF	P	Weight kg
MOB-01Y-W1-10	110	86	-	-	-	-	4	5.1
W2	160	136					8	7.3
W3	210	186					12	9.6
W4	260	236					16	11.8
W5	310	286	250	200	150	100	20	14.0
W6	360	336					24	16.2

03 (nominal diameter) bass block
 MOB-03X-B*-(J)30



Plug Tightening Torque

Plug Configuration	Tightening Torque N-m{kgf-cm}
TPHA-1/2	55 to 66 {560 to 675}
TPHA-3/4	90 to 108 {918 to 1100}

Model No.	Pipe Outlet Size (A, B)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min
MOB-03X-B*-(J)30	1/2	25 {255}	80

Model No.	Dimensions								Weight kg
	LA	LB	LC	LD	LE	LF	M	N	
MOB-03X-B2-(J)30	200	184	80	-	-	-	8	2	10.3
B3	280	264	80	160	-	-	12	3	14.3
B4	360	344	80	160	240	-	16	4	18.4
B5	440	424	80	160	240	320	20	5	22.4

Note) Dimensions in parentheses are for model number MOB-03X-B*-30, which is the model number when using M8 valve mounting bolts.

High-pressure M35 Series

50 to 300ℓ/min
35MPa

Features

The High-Pressure M35 Series responds to the needs of high density in a variety of fields by enabling higher density hydraulic systems.

This valve incorporates NACHI original flow control technology and heat treatment, plus precision machining to create high-performance valves with the following features:

- High-pressure 35MPa
- High reliability and compact design

- Press Machinery
Press brakes, punching presses
- Underground Machinery
Shield tunneling machinery, removal systems, etc.
- Construction Machinery
From mini vehicles to 6 to 10-ton vehicles, shovels, etc.
- Environmental Related
Granulators, filter presses, scrap presses
- Testing Equipment
Impulse, durability, performance testers, etc.

●M35 Series Modular Valve (O * H)

By integrating multiple hydraulic devices, this valve can be used when configuring hydraulic circuits even in the high-pressure range. See page D-12 for information about the O4 size. This series consists of pressure, flow rate, and flow direction control valves.

Maximum Working Pressure : 35MPa{357kgf/cm²}
Maximum Flow Rate : to 300ℓ/min

●M35 Series Non-leak Solenoid Valve (SNH)

A NACHI original structure is used to configure this wettype shutoff valve that isolates internal leaks. Installation conforms to ISO4401 standards, so it can be used in a wide range of applications in combination with modular valves. For more information, see page E-57.

Maximum Working Pressure : 35MPa{357kgf/cm²}
Maximum Flow Rate : to 100ℓ/min

●M35 Series Related Components

- High-response proportional flow control valve
Maximum Working Pressure : 31.4MPa{320kgf/cm²}
Maximum Flow Rate : to 350ℓ/min

●M35 Series Industry Specific Components

- Jack Valve
Maximum Working Pressure : 35MPa{357kgf/cm²}
Maximum Flow Rate : to 100ℓ/min
- Logic Cartridge Mono Block
Maximum Working Pressure : 35MPa{357kgf/cm²}
Maximum Flow Rate : to 7000ℓ/min

●M35 Series Industry Specific Components

- Hydraulic accessories (stop valves, filters, accumulators, hoses, etc.); NACHI-MOOG servo level

Specifications

M35 Series Modular Valve

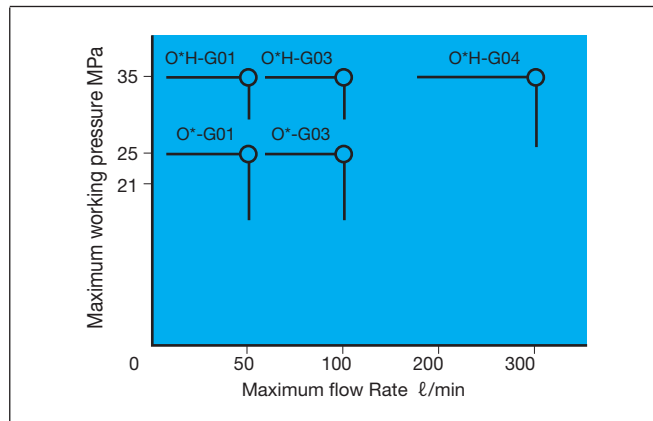
Size	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Number of Integration Levels
01	35 {357}	50	to 3
03		100	
04		300	

Dimensions

Size	Height (mm)	Width (mm)	Remarks
01	40	46	Same dimensions as the M25 Series
03	55	70	
04	70	91	

Note) M8 installation bolts only are used for the 03 size.

Modular Valve Product Series



01 03 Size Specifications

Type	Name	Valve Model Number	Maximum Operating Power	Maximum Flow Rate	Pressure Adjustment Range (Cracking Pressure) MPa{kgf/cm ² }	JIS Symbol
Solenoid Valves	Solenoid Valves	SA-G**-*--31(21) SS-G**-*--31(22)				
Pressure Control Valves	Relief Valves (Balance Type)	ORH-G01-P*-10 -W*-	35MPa {357kgf/cm ² }	G01 40ℓ/min	3:3.5 to 25MPa{35.7 to 255kgf/cm ² } 5:7 to 35MPa{71.4 to 357kgf/cm ² }	
		ORH-G03-P*-10 -W*-		G03 80ℓ/min	P: P (→T) port W: AB (→T) port	
	Relief Valves (Direct Type)	ORH-G01-DW*-10 -DA*- -DB*-		G01 20ℓ/min	3:3.5 to 25MPa{35.7 to 255kgf/cm ² } 5:7 to 35MPa{71.4 to 357kgf/cm ² }	DW: AB (→T) port DA: A (→T) port DB: B (→T) port
Reducing Valve	OGH-G01-P*-10 -B*-	G01 40ℓ/min	3:3.5 to 25MPa{35.7 to 255kgf/cm ² }			
		OGH-G03-P*-(B)-10 -B*-	G03 80ℓ/min	P: P port B: B port		
Flow Control Valves	Flow Regulator Valves	OYH-G01-W-Y-10 -A-Y- -B-Y- -W-X- -A-X- -B-X	35MPa {357kgf/cm ² }	G01 50ℓ/min	Y: Meter out X: Meter in	
		OYH-G03-W-Y-10 -A-Y- -B-Y- -W-X- -A-X- -B-X		G03 100ℓ/min	W: AB port A: A port B: B port	
Direction Control Valves	Check Valves	OCH-G01-P*-10 -T*-	35MPa {357kgf/cm ² }	G01 50ℓ/min	1:0.04MPa{0.4kgf/cm ² } 2:0.35MPa{3.6kgf/cm ² } 3:0.5 MPa{5.1kgf/cm ² }	
		OCH-G03-P*-10 -T*-		G03 100ℓ/min	P: P port T: T port	
Direction Control Valves	Pilot Check Valves	OPH-G01-W*-(F)-10 -A*- -B*-	35MPa {357kgf/cm ² }	G01 50ℓ/min	1:0.2MPa{2.0kgf/cm ² } 2:0.5MPa{5.1kgf/cm ² }	
		OPH-G03-W*-(D)-10 -A*- -B*-		G03 100ℓ/min	W: AB port A: A port B: B port D: Direct type (no small valve, G03 only) F: Decomp type (with small valve, G01 only)	

ORH : Relief valve



OGH : Reducing valve

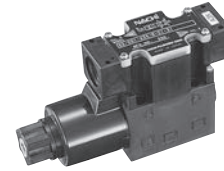


OPH : Pilot check valve



D

Modular Valve



SS Series(Wiring System: Central Terminal Box) Wet Type Solenoid Valve

100 to 160ℓ/min
35MPa

Features

- ① Very long life
The movable iron core of the wet type solenoid is immersed in oil, which keeps it lubricated and cushions it from impact and vibration, ensuring very long life.
- ② Low switching noise
The wet-type solenoid valve provides very low core switching noise, for quiet operation.
- ③ High pressure, large capacity, with minimal pressure loss
Comprehensive fluid reaction force compensation and low pressure
- ④ Easy connections
A special wiring box provides a COM port and indicator light as standard for simple wiring and maintenance.
- ⑤ Easy coil replacement
A plug-in type coil enables one-touch coil replacement.
- ⑥ Wide-ranging backward compatibility makes it simple to replace previous valve models with this one. Combin-

ing this valve with a modular valve contributes to the compact configuration of the overall device.

- ⑦ Compliant with global and international safety regulations (G01 size CE, UL, CSA, and G03 size UL). Can be used safely around the world. Contact us for models and specifications of compliant products.

Specifications

Model No.		SS-G01				SS-G03					
		Standard Type		Shockless Type		Standard Type				Shockless Type	
JIS Symbol	Operation Symbol	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	AC Solenoid Type		DC Solenoid Type (With built-in rectifier)		Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)
	-A2X-	30		30		40		85		85	
	-H2X-										
	-E2X-					85					
	-A3X-	80									
	-H3X-										
	-E3X-										
	-A3Z-	65									
	-H3Z-										
	-E3Z-										
	-A4-	50					35{357}	35{357}			
	-H4-										
	-A5-										
	-H5-	100	35{357}	50	25{255}	130		160		130	25{255}
	-C2-										
	-C5-										
	-C9-										
	-C1S-										
	-C6S-										
	-C1-	AC Solenoid 65									
	-C6-										
	-C4-	50									
	-C7Y-										
	-C8-										

Note) The maximum flow rate of each valve depends on the pressure. For details, see pages E-9 and E-10.

		SS-G01			SS-G03			
		AC Solenoid	DC Solenoid		AC Solenoid	DC Solenoid		
			Built-in Rectifier			Built-in Rectifier		
		C*	E*	D*	C*	E*	D*	
Maximum Working Pressure	P, A, B ports	35(25)MPa{357(255)kgf/cm ² }(Note1)						
Maximum Allowable Backpressure	T port	21MPa{214kgf/cm ² }			16MPa{163kgf/cm ² }			
Switching frequency (cycles/minute)	Standard Type	300	120	300	300	120	240	
	Shockless Type	–		120	–		120	
Standard	Indicator light	R			R			
Option	Shockless	–	F		–	F		
	Surgeless	G	–	G	G	–	G	
	With manual push-button	N			N			
	Quick Return	–	Q	–	–	Q	–	
Weight (kg)	Double Solenoid	1.8	2.0		4.2	5.5		
	Single Solenoid	1.4	1.5		3.5	4.1		
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP64 (Dust-tight, Splash-proof)						
	Ambient Temperature	– 20 to 50°C						
	Operating Fluid	Temperature Range	– 20 to 70°C					
		Kinematic Viscosity Range	15 to 300mm ² /s					
		Filtration	25 μm or less					
Mounting bolt	Size × Length	M5 × 45 (Four)			M6 × 70 (Four) (M8 × 70 (Four))			
	Tightening Torque	M5 5 to 7N·m{51 to 71kgf·cm}			M6 10 to 13N·m{102 to 133kgf·cm} (M8 20 to 25N·m{204 to 255kgf·cm})			

- Note) 1. Maximum operating pressure depends on the valve type. For details, see page E-1.
 2. For mounting bolts, use bolts with 12.9 strength classification or equivalent.
 3. Mounting bolts are not included with the 01 size.
 4. For 03 size installation bolts and spacers are provided. Attach the spacers to the valve to maintain the appropriate fitting length even if you do not use the installation bolts provided to add on modular valves.

● Handling

- 1 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T(R) port. Never use a stopper plug in the T(R) port.
- 2 Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- 3 Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- 4 Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- 5 When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.
- 6 For details about using fire-resistant hydraulic fluid, see page D-1 for more information.
- 7 Use this valve only within the allowable voltage range.
- 8 Do not allow the AC solenoid to become charged until you install the coil into the valve.
- 9 In the case of operation symbols A2X, H2X, and E2X, run drain piping from the valve T port.
- 10 Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup.

Contact your agent when you need to maintain a switching position for a long period.

- 11 When using a detent type (E2X, 3X, E3Z), use constant energization in order to securely maintain the switching position.

12 Note that manual pin operating pressure changes in accordance with tank line back pressure.

13 The series described in the table below are available for use as RSS and RIS Series solenoid control relief valves.

RSS-***-AR*(H)-** ¹⁵ ₂₃ RIS-***-AR*(H)-** ¹⁵ ₂₁	SS-G01-AR-R-**-31
RSS-***-AQ*(H)-** ¹⁵ ₂₃ RIS-***-AQ*(H)-** ¹⁵ ₂₁	SS-G01-A3X-R-**-31
RSS-***-F(H)-** ¹⁵ ₂₃	SS-G01-A8X0-R-**-31
RIS-***-F-**-21	SS-G01-A3X-R-**-31

- 14 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

15 Use the following table for specification when a sub plate is required.

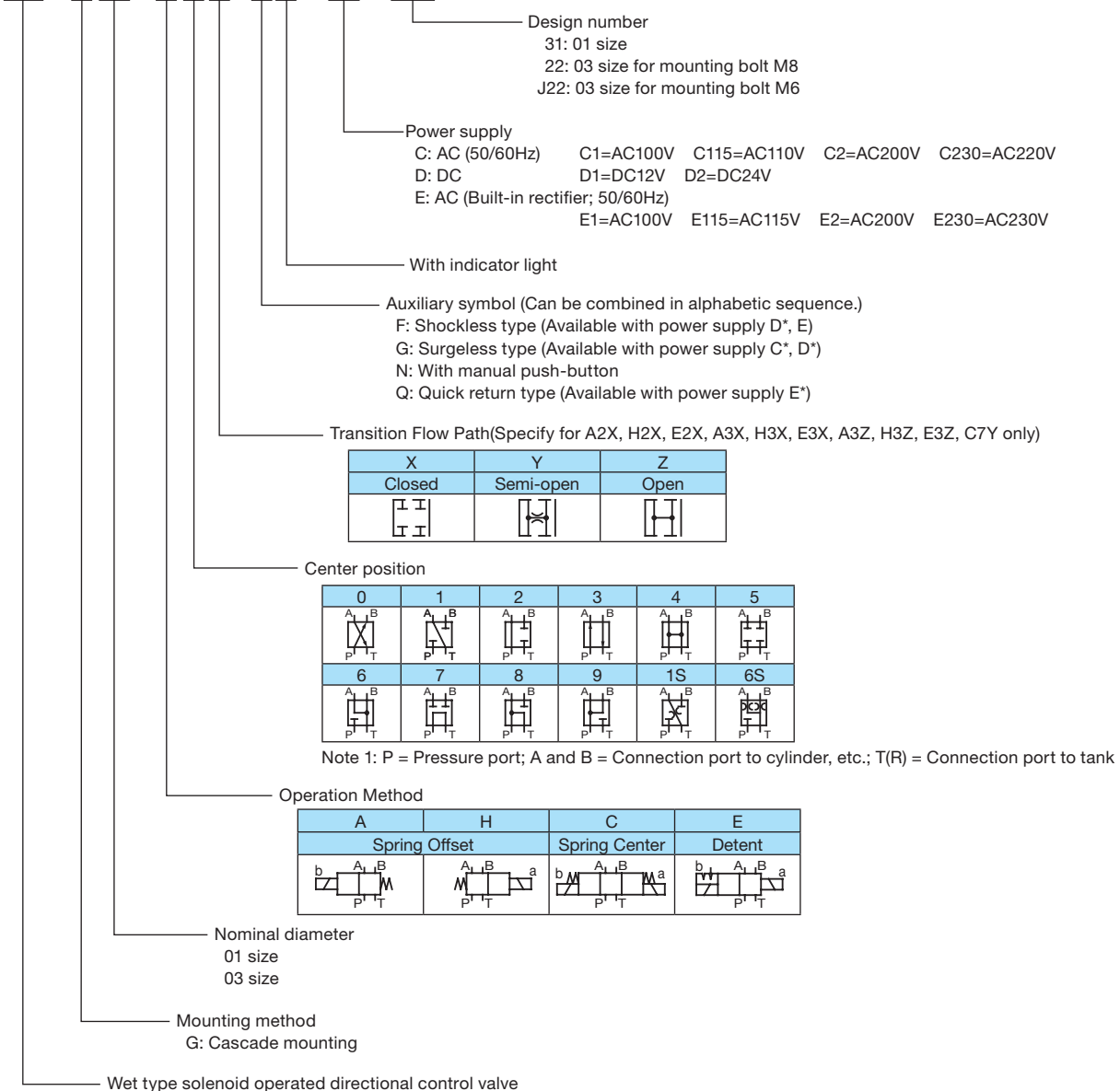
Model No.	Pipe Diameter	Maximum Working Pressure MPa{kgf/cm ² }	Recommended Flow Rate (ℓ/min)	Weight (kg)	Applicable Valve Type
MSA-01X-10	1/4	25{255}	20	1.2	SS-G01-**-R-**-31
MSA-01Y-10	3/8		40		
MSA-03-10	3/8		45	2.3	SS-G03-**-R-**-J22
MSA-03X-10	1/2		80		
MS-03-30	3/8		45	2.3	SS-G03-**-R-**-22
MS-03X-30	1/2		80		

● Solenoid Assembly Specifications

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SS-G01				For SS-G03						
				Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)	Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)	
AC	C1	AC100	50	EDC64-C1	2.2	0.52	25	80 to 110	ECB64-C1	5.4	0.92	36.0	80 to 110	
			60		2.0	0.38	22	90 to 120		4.6	0.62	34.0		
		AC110	60		2.2	0.46	28			5.0	0.78	42.0	90 to 120	
	C115	AC110	50	EDC64-C115	2.0	0.47	25	90 to 120	ECB64-C115	5.0	0.85	36.0	90 to 120	
			60		1.8	0.35	22	100 to 130		4.2	0.57	34.0		
		AC115	60		2.0	0.42	28			4.6	0.72	42.0	100 to 130	
	C2	AC200	50	EDC64-C2	1.1	0.26	25	160 to 220	ECB64-C2	2.7	0.46	36.0	160 to 220	
			60		1.0	0.19	22	180 to 240		2.3	0.31	34.0		
		AC220	60		1.1	0.23	28			2.5	0.39	42.0	180 to 240	
	C230	AC220	50	EDC64-C230	1.0	0.24	25	180 to 240	ECB64-C230	2.5	0.42	36.0	180 to 240	
			60		0.91	0.17	22	200 to 260		2.1	0.29	34.0		
		AC230	60		1.0	0.21	28			2.3	0.36	42.0	200 to 260	
DC with Built-in Rectifier	E1	AC100	50/60	EDC64-E1-1A	0.31		27	90 to 110	ECB64-E1	0.40		34.0	90 to 110	
			AC110		0.26					25	100 to 125			0.33
		AC115	50/60		0.27									27
	E2	AC200	50/60	EDC64-E2-1A	0.15		26	180 to 220	ECB64-E2	0.22		37.0	180 to 220	
			AC220		0.12					24	200 to 250			0.16
		AC230	50/60		0.13									27
DC	D1	DC12	—	EDC64-D1-1A	2.2		26	10.8 to 13.2	ECB64-D1	2.6		31.0	10.8 to 13.2	
	D2	DC24	—	EDC64-D2-1A	1.1		26	21.6 to 26.4	ECB64-D2	1.5		36.0	21.6 to 26.4	

Explanation of model No.

SS - G 03 - A 3 X - * R - C2 - J22

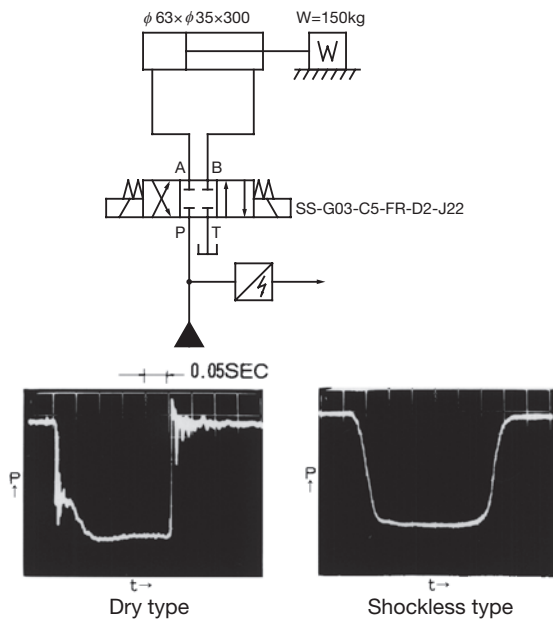


Options

(Auxiliary Symbol Explanations)

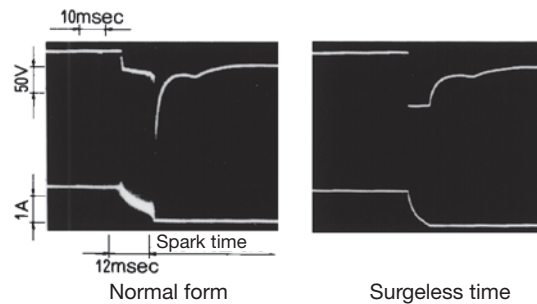
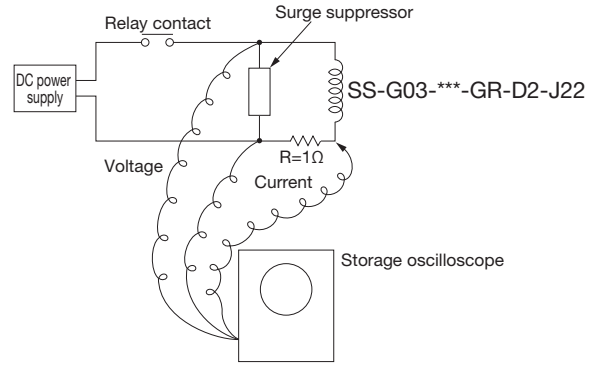
Shockless Type (Auxiliary Symbol: F)

Switching Response Characteristics
The pressure waveforms for each valve in the hydraulic circuit shown below are shown at the bottom of this block. Opening and closing of a dry type valve generates shock (noise) and pipe vibration due to the sudden drop or rise in pressure. With a shockless solenoid valve, pressure fluctuation when the valve is opened or closed is smoothed, which eliminates shock (noise) and pipe vibration.

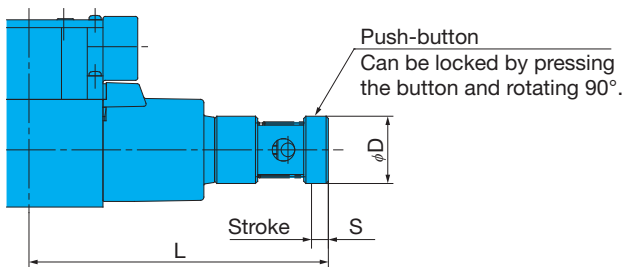


Surgeless Type (Auxiliary Symbol: G)

The surge pressure waveforms when the DC solenoid valve power supply is opened and closed by a relay are shown at the bottom of this block. A built-in surge absorber element eliminates sparking and surge pressure.



Manual Button Type (Auxiliary Symbol: N)

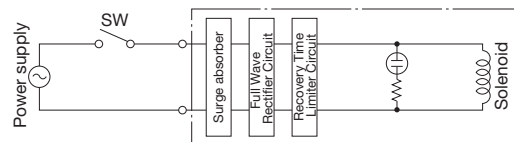


Model No.		L	S	D
SS-G01	AC Solenoid	133.5	7.5	30
	DC Solenoid	140.5		
SS-G03	AC Solenoid	155.5	9.5	35
	DC Solenoid	173.5		

Quick Return (Auxiliary Symbol: Q)

● Handling

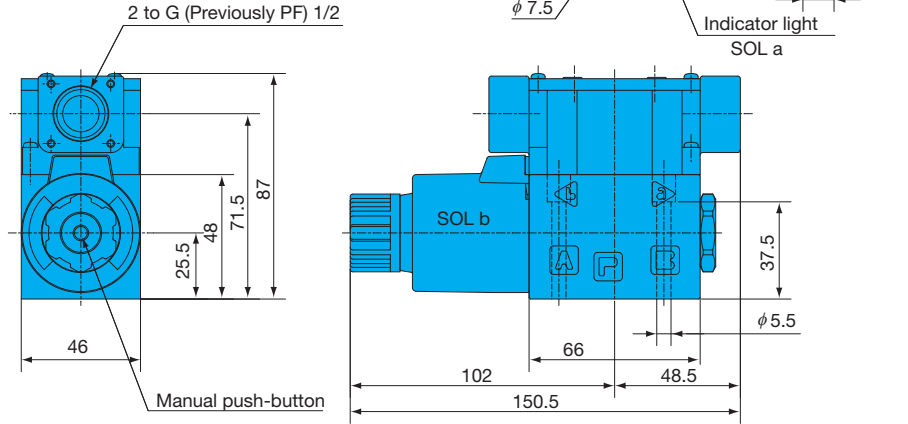
- This type is used in the case of power supply type E* (with built-in rectifier) to shorten the spring return time. This also applies to D*.
- Quick return device is built-in to central terminal box.



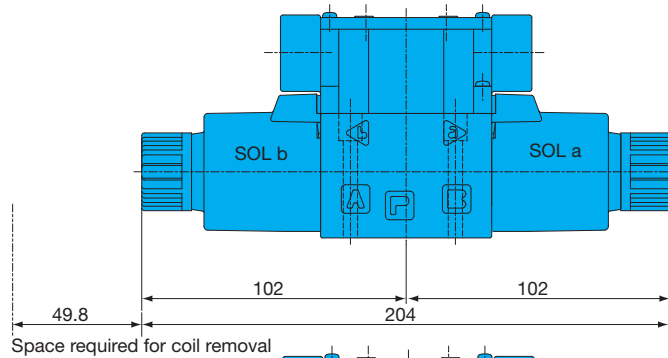
Installation Dimension Drawings

AC Solenoid
 SS-G01-A**-R-C*-31
 SS-G01-H**-R-C*-31

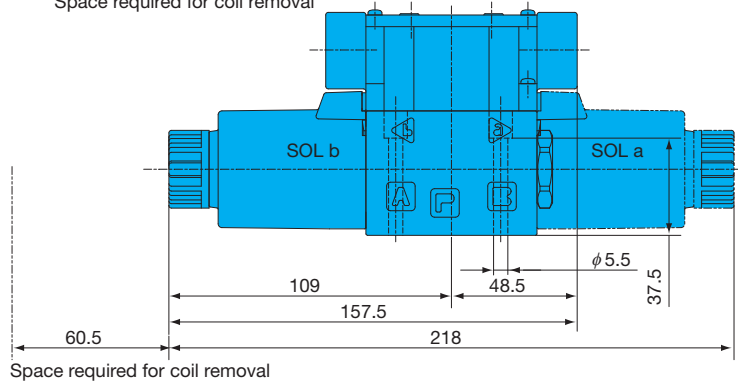
Note) SS-G01-H**-R**-31
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.



SS-G01-C**-R-C*-31
 SS-G01-E**-R-C*-31



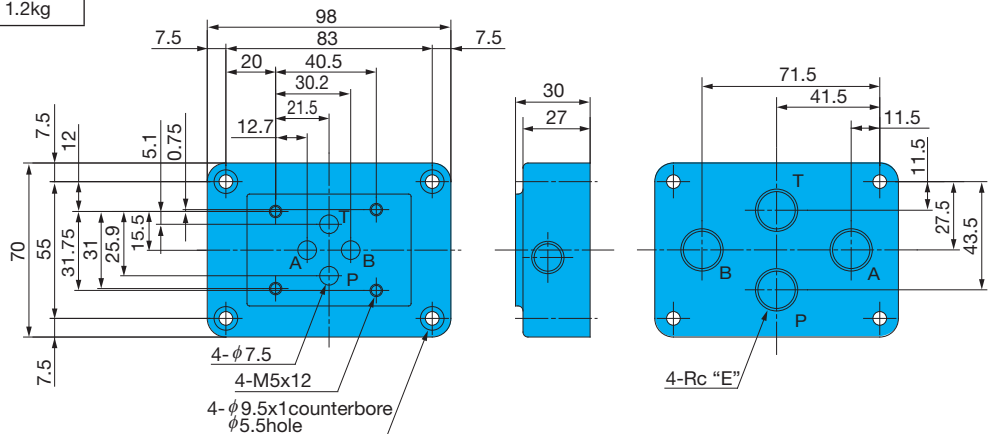
DDC Solenoid and Rectifier
 SS-G01-A**-R-D/E*-31
 SS-G01-H**-R-D/E*-31
 SS-G01-C**-R-D/E*-31
 SS-G01-E**-R-D/E*-31



For sub plate SS-G01

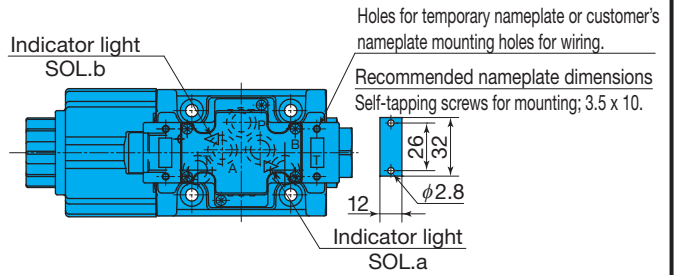
Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
 ISO 4401-03-02-0-05
 (JIS B 8355 D-03-02-0-05)



Installation Dimension Drawings

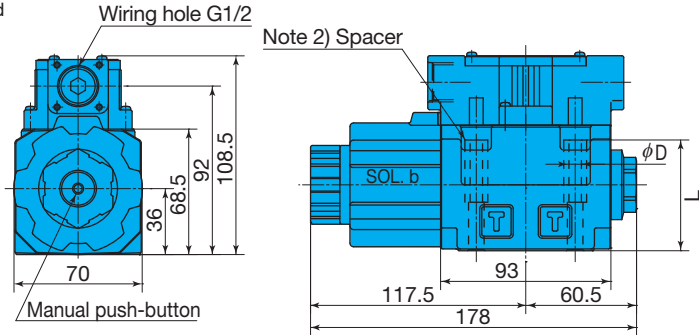
AC Solenoid
 SS-G03-A**-R-C*-J22
 SS-G03-H**-R-C*-J22



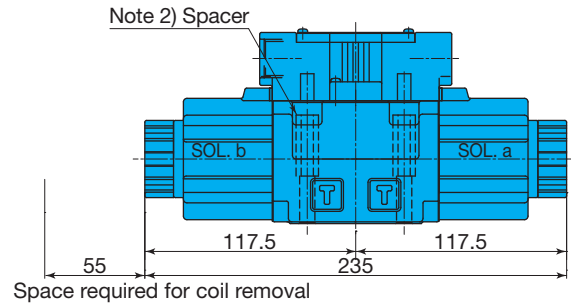
Note 1.) SS-G03-H**-R**-J22
 The solenoid is on the opposite side of that shown for SOL.a in the illustrations shown here.

Note 2.) Attach the spacers to the valve, as shown in the diagram at right, to maintain the appropriate fitting length even if you do not use the installation bolts provided with the SS-G03.

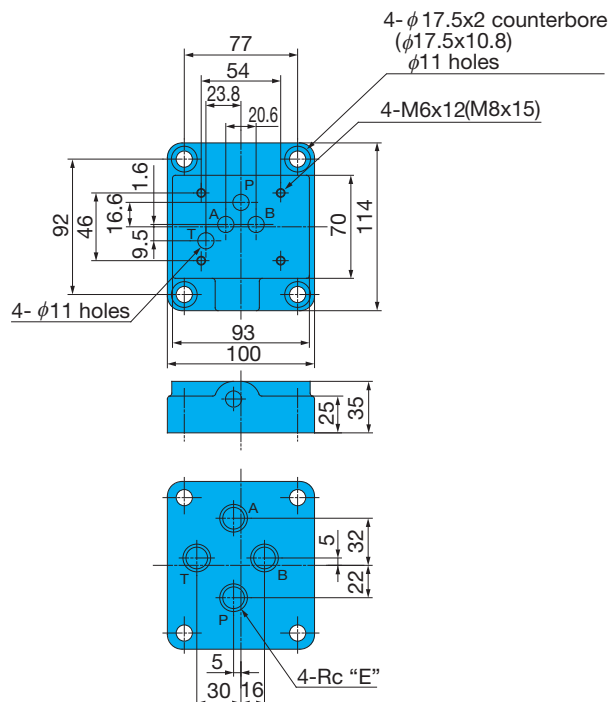
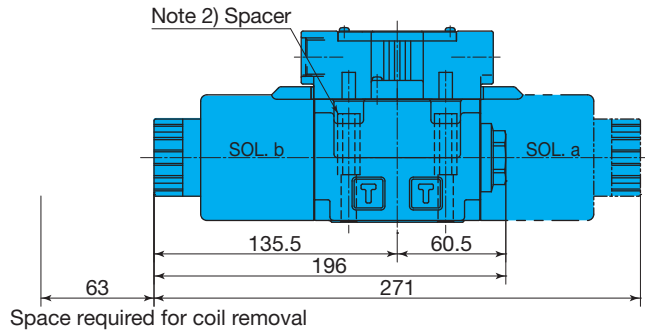
	SS-G03-**-R**-J22	SS-G03-**-R**-22
ϕD	$\phi 6.8$	$\phi 8.5$
L	60.5	58



SS-G03-C**-R-C*-J22
 SS-G03-E**-R-C*-J22



DC Solenoid and Rectifier
 SS-G03-A**-R-D*/E*-J22
 SS-G03-H**-R-D*/E*-J22
 SS-G03-C**-R-D*/E*-J22
 SS-G03-E**-R-D*/E*-J22

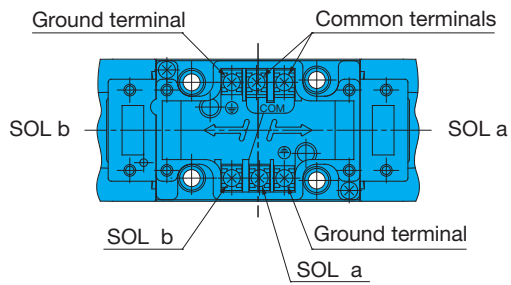


For sub plate SS-G03

Mounting bolt	Model No.	E	Weight
M6	MSA-03-10	3/8	2.3kg
	MSA-03X-10	1/2	
M8	MS-03-30	3/8	
	MS-03X-30	1/2	

M6 gasket surface dimensions
 ISO 4401-05-04-0-05
 (JIS B 8355 D-05-04-0-05)

Wiring Diagram



- Note) 1. In the case of a double solenoid valve, a common terminal is provided to simplify wiring. When the common terminal is not used, remove the terminal screws.
 2. Use the ground terminal when grounding is required.
 3. In the case of a solderless terminal, M3 screws.
 4. Tighten terminal screws to a torque of 0.5 to 0.7N-m {5.1 to 7.1kgf-cm}.

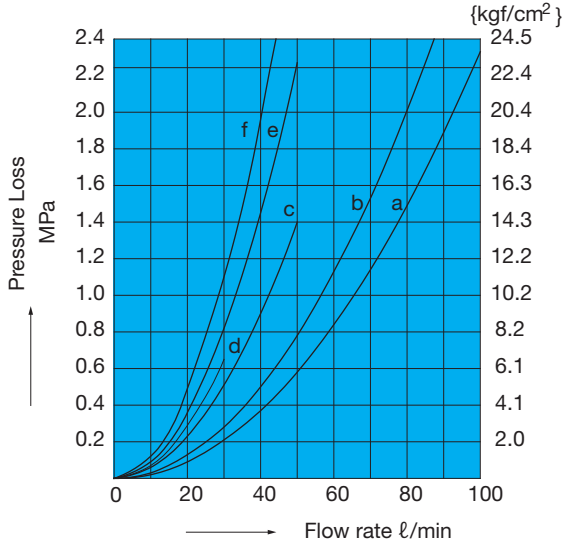
Electrical Circuit Diagram

Type	Model No.	Electrical Circuit
AC Solenoid	SS-G01-***-R-C*- 31 G03 J22	
AC Solenoid Surgeless Type	SS-G01-***-GR-C*- 31 G03 J22	
Built-in Rectifier	SS-G01-***-R-E*- 31 G03 J22	
DC Solenoid	SS-G01-***-R-D*- 31 G03 J22	
DC Solenoid Surgeless Type	SS-G01-***-GR-D*- 31 G03 J22	
Built-in Rectifier Quick Return Type	SS-G01-***-QR-E*- 31 G03 J22	See page E-4 for more information.

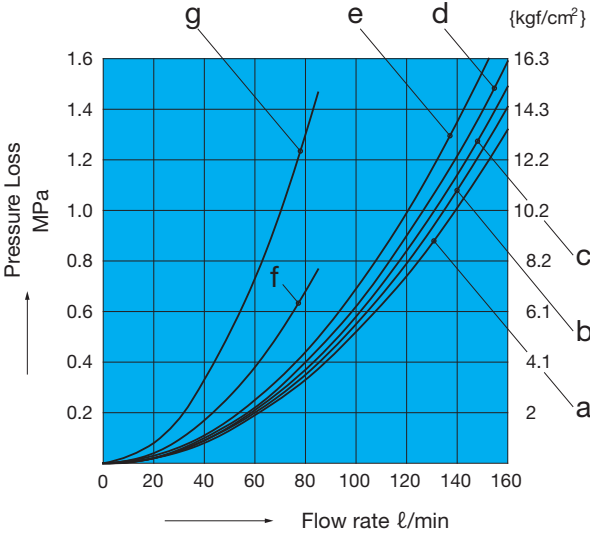
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SS-G01	A2X, H2X, E2X	d	d	-	-	-
	A3X, H3X	b	b	b	b	-
	E3X	b	b	b	b	-
	A3Z, H3Z, E3Z	a	a	a	a	-
	A4, H4, C4	a	a	a	a	a
	A5, H5, C5, C6S	b	b	b	b	-
	C1, C1S	b	b	a	b	-
	C2	a	b	b	b	-
	C6	b	b	a	a	-
	C7Y	f	f	e	e	c
C8	a	f	b	e	c	
C9	a	a	b	b	-	



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SS-G03	A2X, H2X, E2X	e	e	-	-	-
	A5	-	c	c	-	-
	H5	c	-	-	c	-
	A3X, H3X, E3X	c	c	d	d	-
	A3Z, H3Z	a	a	d	d	-
	E3Z	b	b	a	a	-
	C1	c	c	a	c	-
	C2	a	c	c	c	-
	A4, H4, C4	a	a	a	a	a
	C5, C1S, C6S	c	c	c	c	-
	C6	c	c	a	a	-
	C7Y	g	g	g	g	f
	C8	a	g	a	g	f
C9	a	a	c	c	-	

Switching Response Time

Model No.	Response Time (sec)		Measurement Conditions
	Solenoid ON	Spring Return	
SS-G01-**-R-C*-J22	0.02 to 0.03	0.02 to 0.03	14MPa{143kgf/cm ² } 30ℓ/min
SS-G01-**-(G)R-D*-J22	0.03 to 0.04	0.02 to 0.04	
SS-G01-**-R-E*-J22	0.03 to 0.04	0.07 to 0.10	
SS-G01-**-F(G)R-D*-J22	0.07 to 0.10	0.04 to 0.07	
SS-G01-**-FR-E*-J22	0.07 to 0.10	0.10 to 0.15	
SS-G03-**-R-C*-J22	0.02 to 0.03	0.02 to 0.03	14MPa{143kgf/cm ² } 70ℓ/min
SS-G03-**-(G)R-D*-J22	0.06 to 0.09	0.03 to 0.05	
SS-G03-**-R-E*-J22	0.07 to 0.10	0.10 to 0.15	
SS-G03-**-F(G)R-D*-J22	0.13 to 0.15	0.08 to 0.15	
SS-G03-**-FR-E*-J22	0.10 to 0.15	0.15 to 0.20	

Note) 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

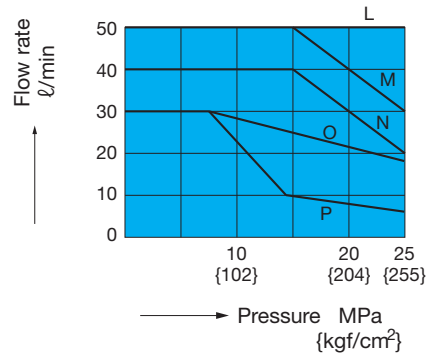
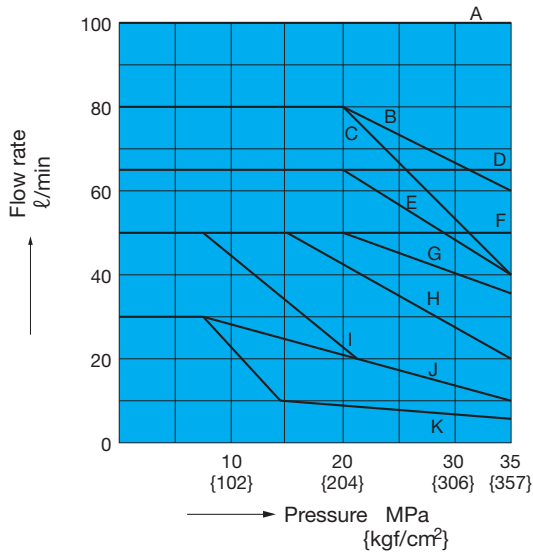
2. In the case of power supply type E* (with built-in rectifier), the spring return time using Quick Return (option symbol: Q) is the same as D*.

Pressure – Flow Volume Allowable Value

Size	Standard Form, with AC, DC solenoid		
	SS-G01-**-R**-31		
Operation Example			
Operation Symbol			
A2X, H2X	-	K	K
E2X	-	J	J
A3X, H3X	B	K	K
E3X	A	J	J
A3Z, H3Z	D	D	D
E3Z	D	D	D
A5	A	-	I
H5	A	I	-
C1, C6	Note1) C(E)	I	I
C1S, C5, C6S	A	I	I
C2, C9	A	K	K
A4	F	F	F
H4	F	F	F
C4	F	F	F
C7Y, C8	Note2) G(H)	K	K

Note) 1. Letter in parentheses is for AC solenoid.
 2. Letter in parentheses is for solenoid with built-in rectifier (E*), but without Quick Return, and for DC solenoid (D*) with surge voltage absorbing diode on the electrical circuit.

Size	Shockless Type, with DC solenoid		
	SS-G01-**-FR**-31		
Operation Example			
Operation Symbol			
A2X, H2X	-	P	P
E2X	-	O	O
A3X, H3X	L	P	P
E3X	L	O	O
A3Z, H3Z	L	L	L
E3Z	L	L	L
A5	L	-	P
H5	L	P	-
C1, C6	M	P	P
C1S, C2, C5, C6S, C9	L	P	P
A4, H4	L	L	L
C4	L	L	L
C7Y, C8	N	P	P



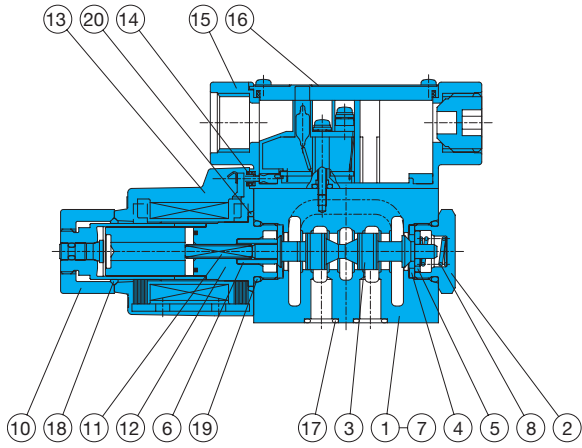
Pressure – Flow Volume Allowable Value

Model No.	Standard Form, with AC Solenoid			Standard Form, with DC Solenoid		
	SS-G03-**-R-C*-J22			SS-G03-**-R-**-J22		
Operation Example						
Operation Symbol						
A2X	-	F	E	-	G	H
H2X	-	E	F	-	H	G
E2X	-	C	C	-	D	D
A3X	A	E	E	A	F	H
H3X	A	E	E	A	H	F
A3Z	A	A	C	A	D	D
H3Z	A	C	A	A	D	D
E3X, E3Z	A	C	C	A	D	D
A5	A	-	D	A	-	G
H5	A	D	-	A	G	-
C1S, C5, C6S	A	D	D	A	G	G
C1, C6	A	D	D	B	G	G
C2	A	G	D	A	I	G
A4, H4, C4	A	A	A	A	A	A
C9	A	G	G	A	I	I
C7Y, C8	B	B	B	Note1) C(E)	C(E)	C(E)
Model No.	Shockless Type, with DC solenoid					
	SS-G03-**-FR-**-J22					
Operation Example						
Operation Symbol						
A2X	-	E	F			
H2X	-	F	E			
E2X	-	C	C			
A3X	A	D	F			
H3X	A	F	D			
A3Z	A	C	C			
H3Z	A	C	C			
E3X, E3Z	A	C	C			
A5	A	-	E			
H5	A	E	-			
C1, C1S, C5, C6, C6S	A	E	E			
C2	A	G	E			
A4, H4, C4	A	A	A			
C9	A	G	G			
C7Y, C8	Note1) B(H)	B(H)	B(H)			

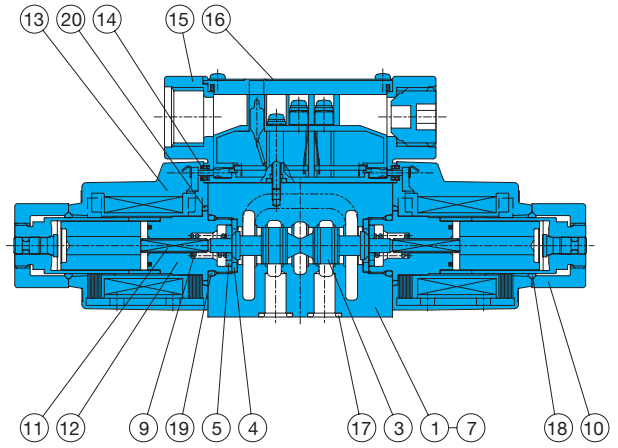
- Note) 1. Letter in parentheses is for solenoid with built-in rectifier (E*), but without Quick Return, and for DC solenoid (D*) with surge voltage absorbing diode on the electrical circuit.
 2. There is no shockless type for the AC solenoid (C*), so use a solenoid with built-in rectifier (E*) when shockless operation is required with an AC power supply.
 3. The maximum flow rate is the allowable value of each port.

Cross-sectional Drawings

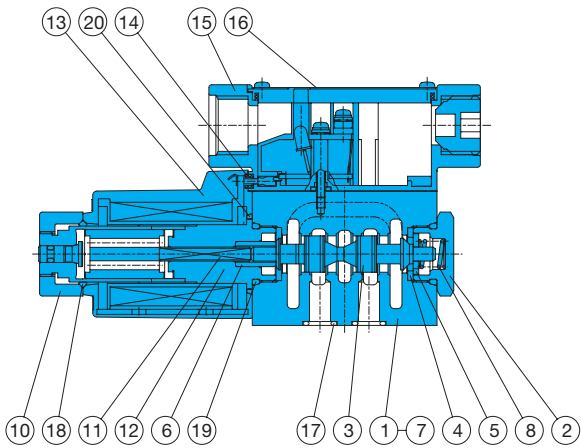
SS-G01-A**-R-C*-31



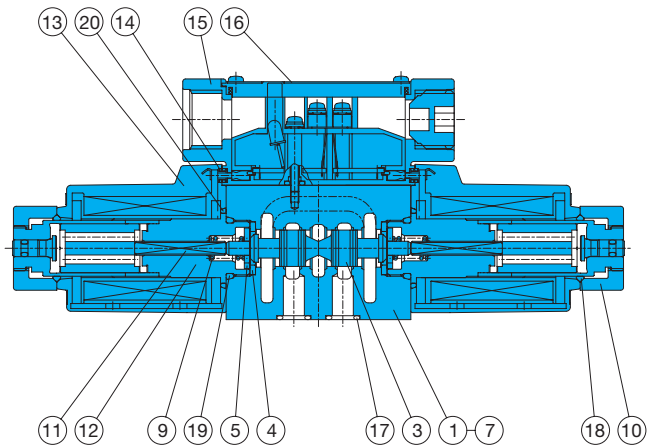
SS-G01-C**-R-C*-31



SS-G01-A**-R-D/E*-31



SS-G01-C**-R-D/E*-31



List of Sealing Parts

Part No.	Part Name	Part Number	Q'ty	
			Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)	4	4
18	O-ring	NBR-70-1 P20	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

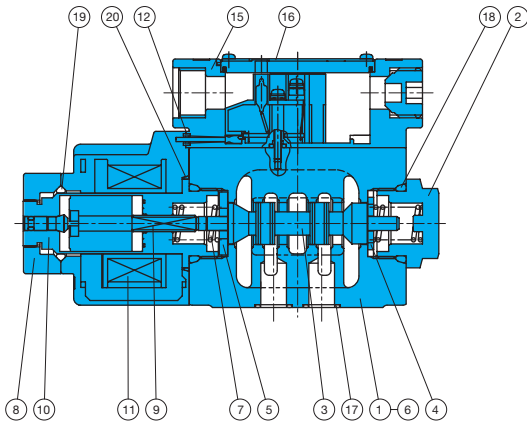
Single Solenoid	Double Solenoid
EDCS-A	EDCS-C

Part No.	Part Name	Part No.	Part Name
1	Body	11	Rod
2	Plug	12	Solenoid guide
3	Spool	13	Solenoid coil
4	Retainer A	14	Packing
5	Retainer B	15	Terminal box kit
6	Retainer C	16	Nameplate
7	Spacer	17	O-ring
8	Spring A	18	O-ring
9	Spring C	19	O-ring
10	Nut	20	O-ring

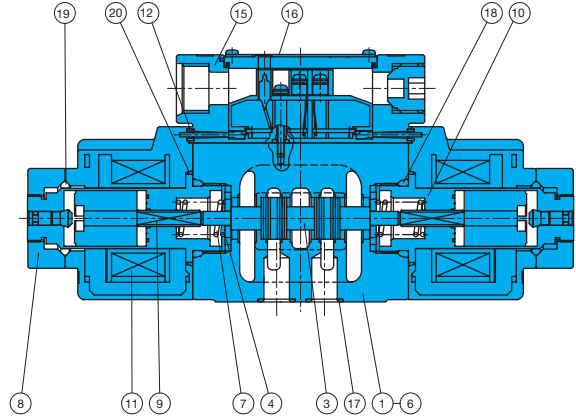


Cross-sectional Drawings

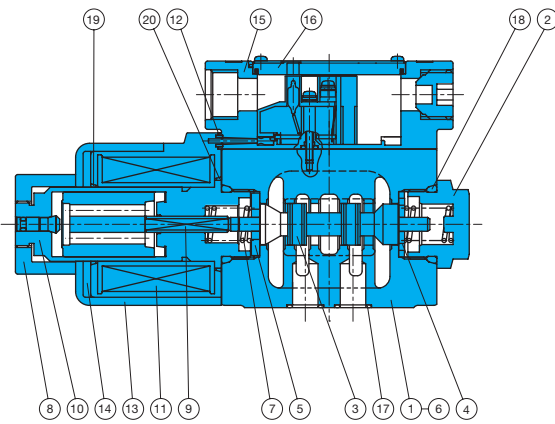
SS-G03-A**-R-C*-J22



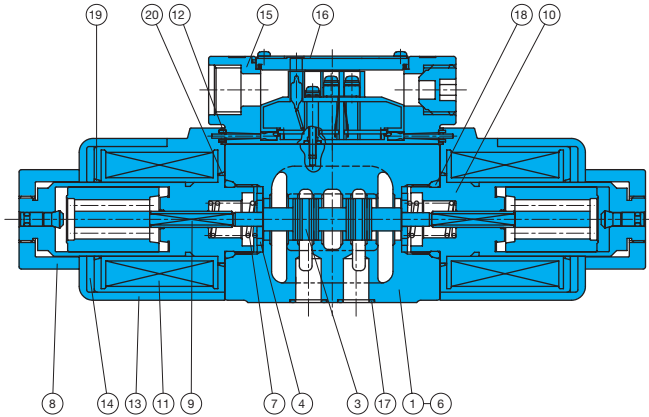
SS-G03-C**-R-C*-J22



SS-G03-A**-R-D/E*-J22



SS-G03-C**-R-D/E*-J22



List of Sealing Parts

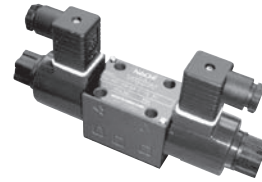
Part No.	Part Name	Type/Part Number		Q'ty	
		AC SOL.	DC SOL.	Single Solenoid	Double Solenoid
17	O-ring	AS568-014(NBR-90)		5	5
18	O-ring	NBR-90 P28		2	2
19	O-ring	NBR-70-1 P26	AS568-026(NBR-70-1)	1	2
20	O-ring	AS568-029(NBR-70-1)		1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

AC SOL.		DC SOL.	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
ECBS-AA	ECBS-CA	ECBS-AD	ECBS-CD

Part No.	Part Name	Part No.	Part Name
1	Body	14	Coil yoke
2	Plug	15	Terminal box kit
3	Spool	16	Nameplate
4	Retainer	17	O-ring
5	Retainer B	18	O-ring
6	Spacer	19	O-ring
7	Spring	20	O-ring
8	Nut		
9	Rod		
10	Solenoid guide		
11	Solenoid coil		
12	Packing B		
13	Coil case		



SA Series(Wiring System: DIN Connector Type) Wet Type Solenoid Valve

100 to 160ℓ/min
35MPa

Features

- ① Very long life
The movable iron core of the wet type solenoid is immersed in oil, which keeps it lubricated and cushions it from impact and vibration, ensuring very long life.
- ② Low switching noise
The wet-type solenoid valve provides very low core switching noise, for quiet operation.
- ③ Shockless
A switching speed adjustment mechanism enables direct, shockless operation (Option F).
- ④ No surge voltage
Sparking and surge voltage during solenoid switching is canceled for stable switching (Option G).
- ⑤ Easy coil replacement
A DIN connector type coil enables one-touch coil replacement.
- ⑥ Wide-ranging backward compatibility makes it simple to replace previous valve models with this one. Combining this valve with a modular valve contributes to the compact configuration of the overall device.
- ⑦ Global support (G01 size)
Meets overseas safety standards (CE, UL, and CSA). It can be safely used anywhere in the world. Contact your agent for certified products.

Specifications

Model No.		SA-G01				SA-G03					
		Standard Type		Shockless Type		Standard Type				Shockless Type	
						AC Solenoid Type		DC Solenoid Type (With built-in rectifier)			
JIS Symbol	Operation Symbol	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)
	-A2X-	30		30		40		85		85	
	-H2X-					85					
	-E2X-										
	-A3X-	80									
	-H3X-										
	-E3X-										
	-A3Z-	65									
	-H3Z-										
	-E3Z-										
	-A4-	50									
	-H4-										
	-A5-										
	-H5-	35{357}		50	25{255}	130		160		130	25{255}
	-C2-										
	-C5-										
	-C9-	100									
	-C1S-										
	-C6S-										
	-C1-	AC Solenoid 65									
	-C6-										
	-C4-	50									
	-C7Y-										
	-C8-										

Note) The maximum flow rate of each valve depends on the pressure. For details, see pages E-21 and E-22.

		SA-G01			SA-G03		
		AC Solenoid	DC Solenoid		AC Solenoid	DC Solenoid	
			Built-in Rectifier			Built-in Rectifier	
		C*	E*	D*	C*	E*	D*
Maximum Working Pressure	P, A, B ports	35(25)MPa{357(255)kgf/cm ² } (Note 1)					
Maximum Allowable Backpressure	T port	21MPa{214kgf/cm ² }			16MPa{163kgf/cm ² }		
Switching frequency (cycles/minute)	Standard Type	300	120	300	300	120	240
	Shockless Type	–		120	–		120
Option	Indicator light	R			R		
	Shockless	–	F		–	F	
	Surgeless	G	–	G	G	–	G
	G Screw Connector	J	–	J	J	–	J
	With manual push-button	N			N		
Weight (kg)	Double Solenoid	1.8	2.0		4.2	5.5	
	Single Solenoid	1.4	1.5		3.5	4.1	
Operating Environment	Dust Resistance/Water Resistance	JIS C 0920 IP65 (Dust-tight, Waterjet-proof) (Note 2)					
	Ambient Temperature	-20 to 50°C					
	Operating Fluid	Temperature Range	-20 to 70°C				
		Kinematic Viscosity Range	15 to 300mm ² /s				
	Filtration	25 μm or less					
Mounting bolt	Size × Length	M5×45 (Four)			M6×70 (Four) (M8×70 (Four))		
	Tightening Torque	M5 5 to 7N·m{51 to 71kgf·cm}			M6 10 to 13N·m{102 to 133kgf·cm} (M8 20 to 25N·m{204 to 255kgf·cm})		

- Note 1. Maximum operating pressure depends on the valve type. For details, see page E-13.
 2. The power supply type for E* is IP64 (dust-tight, splash-proof).
 3. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
 4. Mounting bolts are not included with the 01 size. Bolts are included with the 03 size.

● Handling

- 1 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T(R) port. Never use a stopper plug in the T(R) port.
- 2 Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- 3 Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- 4 Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- 5 When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.
- 6 For details about using fire-resistant hydraulic fluid, see page D-1 for more information.
- 7 Use this valve only within the allowable voltage range.
- 8 Do not allow the AC solenoid to become charged until you install the coil into the valve.
- 9 In the case of operation symbols A2X, H2X, and E2X, run drain piping from the valve T port.
- 10 Maintaining a switching position under high pressure for a long period can cause abnormal operation due to

hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.

- 11 When using a detent type (E2X, 3X, E3Z), use constant energization in order to securely maintain the switching position.

12 Note that manual pin operating pressure changes in accordance with tank line back pressure.

13 The series described in the table below are available for use as the RSA Series solenoid control relief valve.

RSA-***-AR*(H)-** ¹⁵ ₂₃	SA-G01-AR-**-31
RSA-***-AQ*(H)-** ¹⁵ ₂₃	SA-G01-A3X-**-31
RSA-***-F(H)-** ¹⁵ ₂₃	SA-G01-A8X0-**-31

- 14 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

15 Use the following table for specification when a sub plate is required.

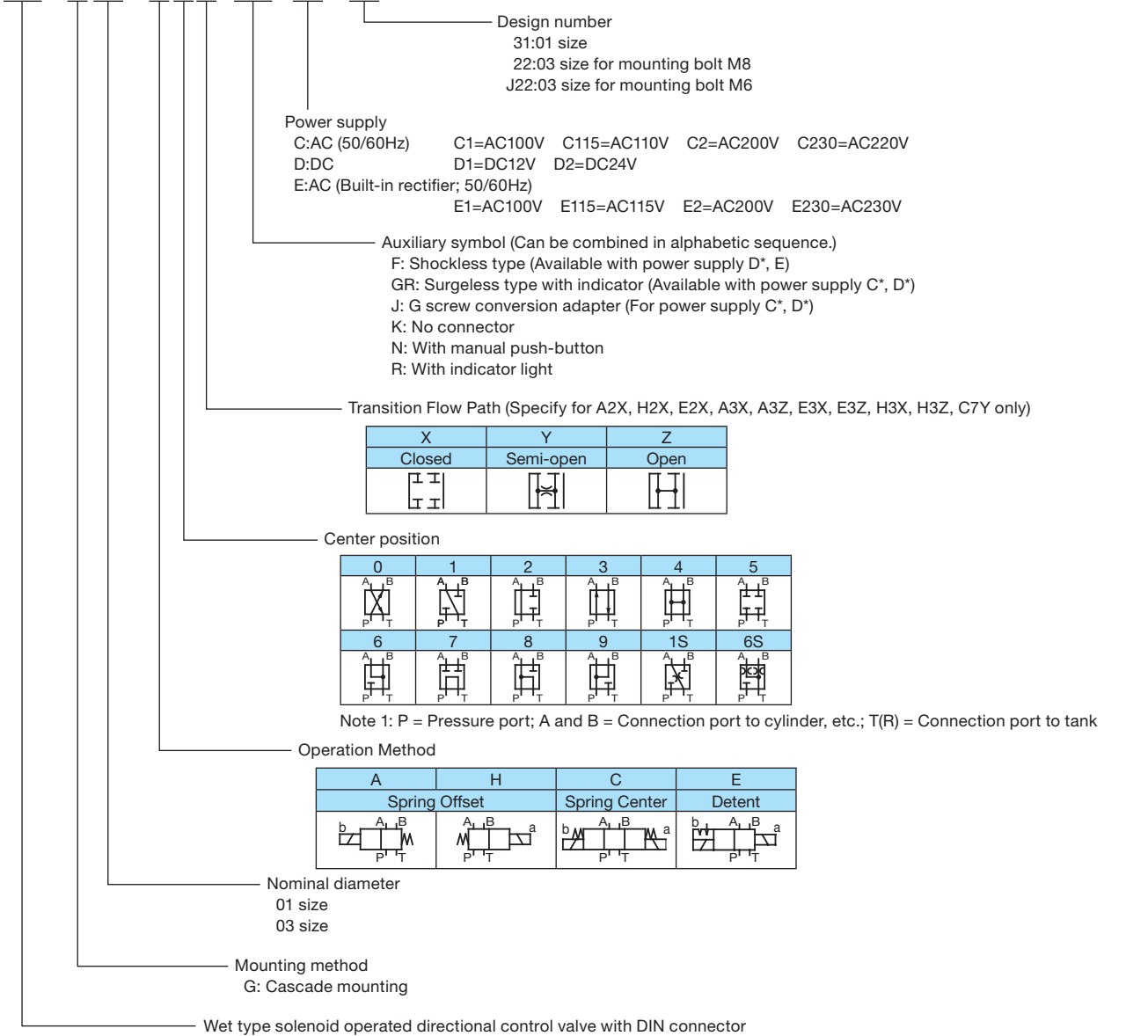
Model No.	Pipe Diameter	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate (ℓ/min)	Weight (kg)	Applicable Valve Type
MSA-01X-10	1/4	25{255}	20	1.2	SA-G01-***-**-31
MSA-01Y-10	3/8		30		
MSA-03-10	3/8		45	2.3	SA-G03-***-**-J21
MSA-03X-10	1/2		80		
MS-03-30	3/8		45	2.3	SA-G03-***-**-21
MS-03X-30	1/2		80		

● Solenoid Assembly Specifications

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SA-G01				For SA-G03					
				Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)	Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)
AC	C1	AC100	50	EAC64-C1	2.2	0.52	25	80 to 110	EBB64-C1	5.4	0.92	36.0	80 to 110
			60		2.0	0.38	22			90 to 120	4.6	0.62	
		AC110	60		2.2	0.46	28	90 to 120			5.0	0.78	42.0
	C115	AC110	50	EAC64-C115	2.0	0.47	25	90 to 120	EBB64-C115	5.0	0.85	36.0	90 to 120
			60		1.8	0.35	22			100 to 130	4.2	0.57	
		AC115	60		2.0	0.42	28	100 to 130			4.6	0.72	42.0
	C2	AC200	50	EAC64-C2	1.1	0.26	25	160 to 220	EBB64-C2	2.7	0.46	36.0	160 to 220
			60		1.0	0.19	22			180 to 240	2.3	0.31	
		AC220	60		1.1	0.23	28	180 to 240			2.5	0.39	42.0
	C230	AC220	50	EAC64-C230	1.0	0.24	25	180 to 240	EBB64-C230	2.5	0.42	36.0	180 to 240
			60		0.91	0.17	22			200 to 260	2.1	0.29	
		AC230	60		1.0	0.21	28	200 to 260			2.3	0.36	42.0
DC with Built-in Rectifier	E1	AC100	50/60	EAC64-E1-1A	0.31		27	90 to 110	EBB64-E1	0.40		34.0	90 to 110
	E115	AC110	50/60	EAC64-E115-1A	0.26		25	100 to 125	EBB64-E115	0.33		31.0	100 to 125
		AC115			0.27		27			0.34		34.0	
	E2	AC200	50/60	EAC64-E2-1A	0.15		26	180 to 220	EBB64-E2	0.22		37.0	180 to 220
		E230	AC220	50/60	EAC64-E230-1A	0.12		24	200 to 250	EBB64-E230	0.16		30.0
	AC230		0.13			27	0.17				33.0		
DC	D1	DC12	—	EAC64-D1-1A	2.2		26	10.8 to 13.2	EBB64-D1	2.6		31.0	10.8 to 13.2
	D2	DC24	—	EAC64-D2-1A	1.1		26	21.6 to 26.4	EBB64-D2	1.5		36.0	21.6 to 26.4

Explanation of model No.

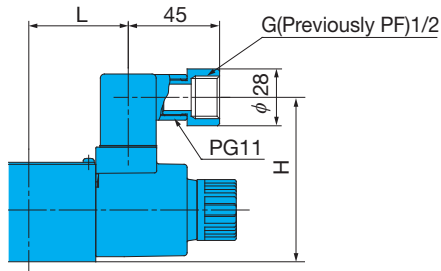
SA - G 01 - A 3 X - ** - C2 - 31



Options

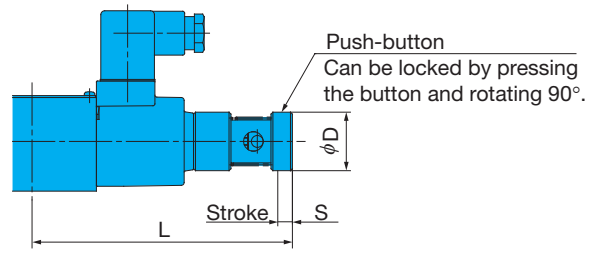
(Auxiliary Symbol Explanations)

G Screw Adapter (Auxiliary Symbol: J)



Model No.	L	H
SA-G01	49	81
SA-G03	60.5	100.5

With manual push-button (Auxiliary Symbol: N)



Model No.		L	S	D
SA-G01	AC Solenoid	133.5	7.5	30
	DC Solenoid	140.5		
SA-G03	AC Solenoid	155.5	9.5	35
	DC Solenoid	173.5		

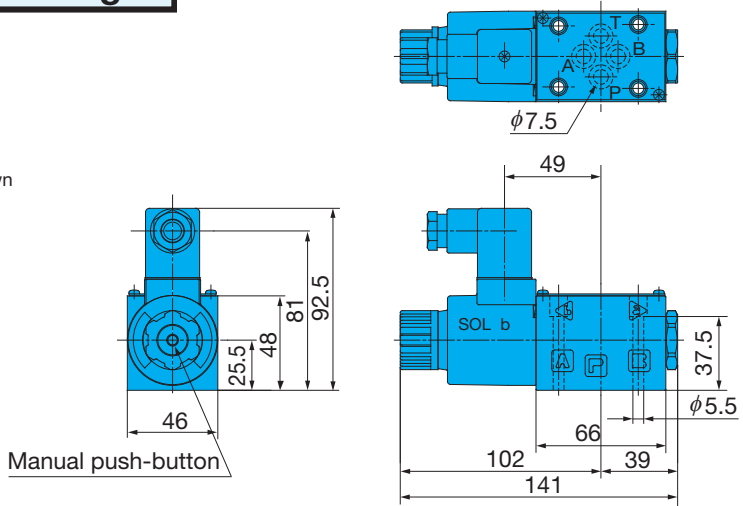
Other Options

Note) For information about the shockless and surgeless options, see page E-4.

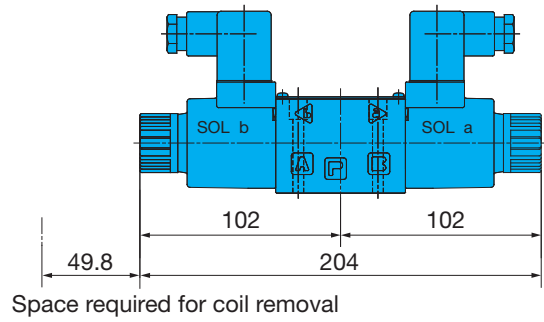
Installation Dimension Drawings

AC Solenoid
 SA-G01-A**-*-C*-31
 SA-G01-H**-*-C*-31

Note) SA-G01-H**-*-R**-31
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.

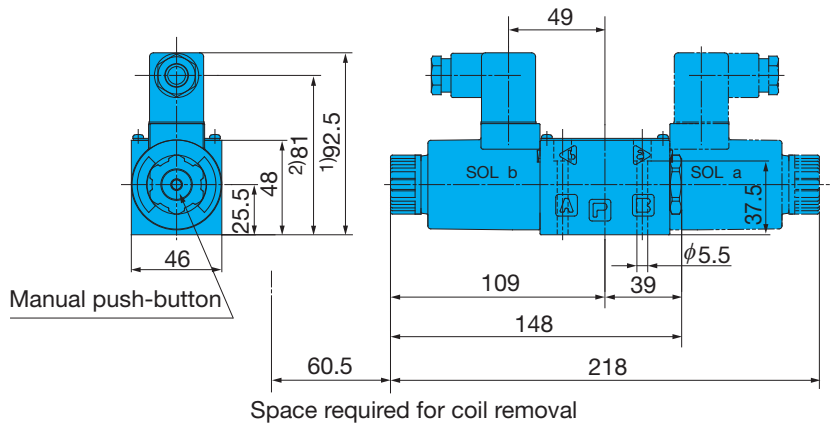


SA-G01-C**-R-C*-31
 SA-G01-E**-R-C*-31



DC Solenoid and Rectifier
 SA-G01-A**-D*/E*-31
 SA-G01-H**-D*/E*-31
 SA-G01-C**-D*/E*-31
 SA-G01-E**-D*/E*-31

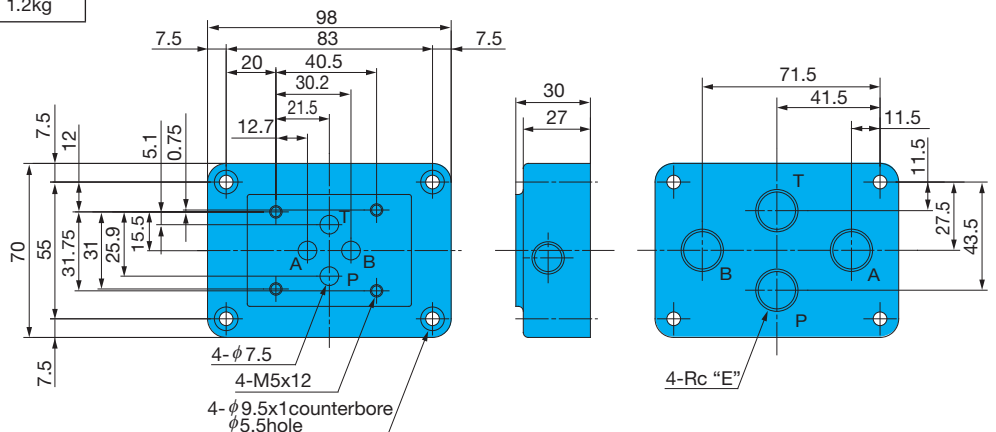
Note) 1. SA-G01-H**-*-D*/E*-31
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
 2. SA-G01-**-E*-31
 Dimension 1 is 96.
 Dimension 2 is 73.



For sub plate SA-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
 (ISO 4401-03-02-0-05)
 (JIS B 8355 D-03-02-0-05)

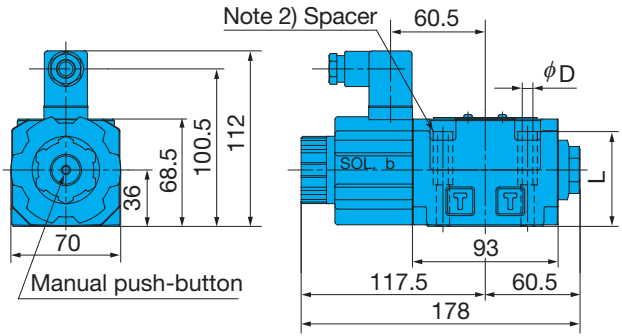
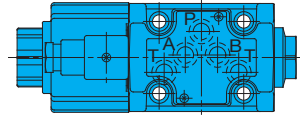


Installation Dimension Drawings

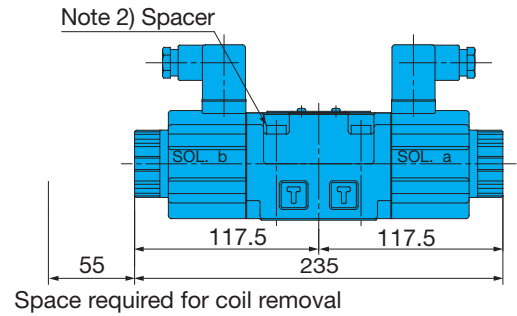
AC Solenoid
 SA-G03-A**-*-C*-J21
 SA-G03-H**-*-C*-J21

- Note 1.) SS-G03-H**-*-R**-J22
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
- Note 2.) Attach the spacers to the valve, as shown in the diagram at right, to maintain the appropriate fitting length even if you do not use the installation bolts provided with the SS-G03.

	SA-G03-**-*-J21	SA-G03-**-*-21
ϕD	$\phi 6.8$	$\phi 8.5$
L	60.5	58

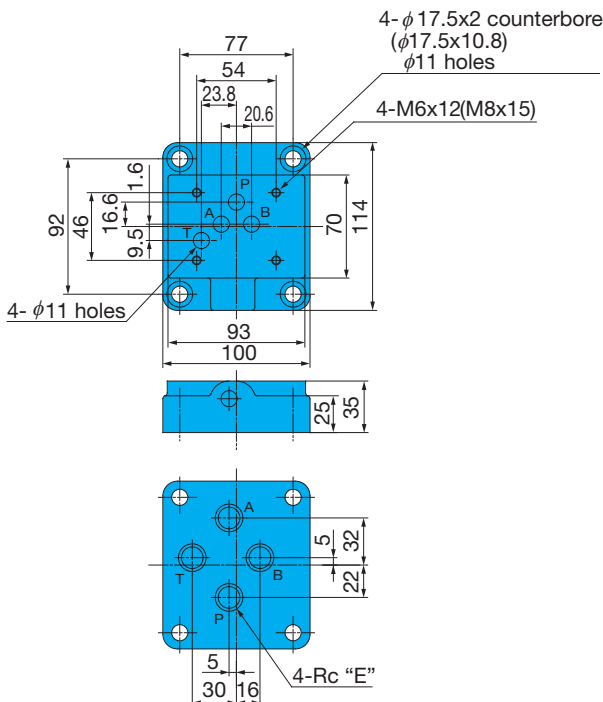
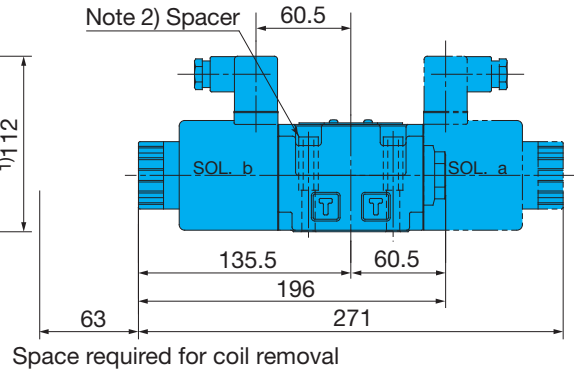
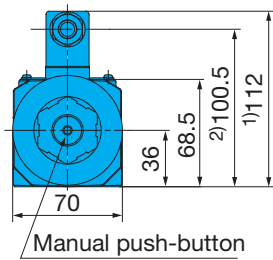


SA-G03-C**-*-C*-J21
 SA-G03-E**-*-C*-J21



DC Solenoid and Rectifier
 SA-G03-A**-*-D*/E*-J21
 SA-G03-H**-*-D*/E*-J21
 SA-G03-C**-*-D*/E*-J21
 SA-G03-E**-*-D*/E*-J21

- Note 1.) SA-G03-H**-*-D*/E*-J21
 The solenoid is on the opposite side of that shown for SOLa in the illustrations shown here.
- 2.) SA-G03-**-*-E*-J21
 Dimension 1 is 115.5.
 Dimension 2 is 92.5.

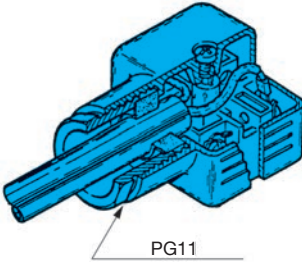
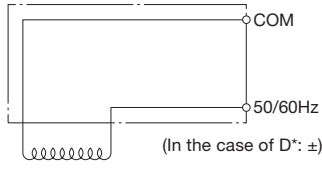
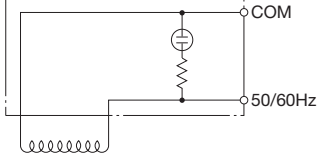
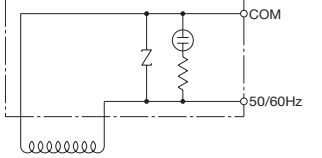
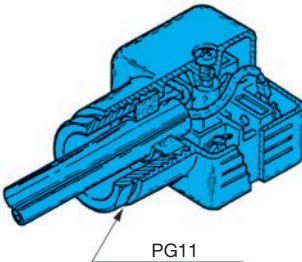
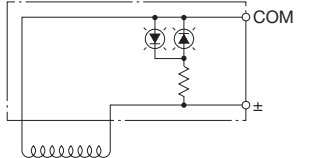
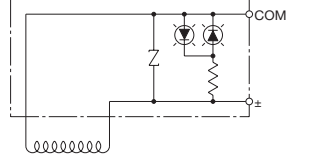
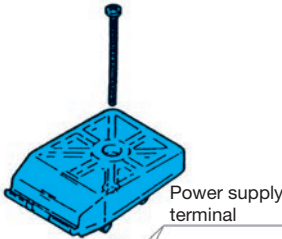
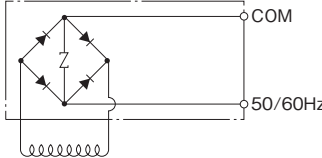
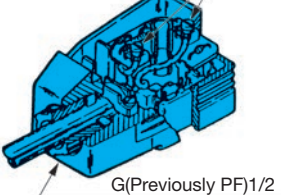
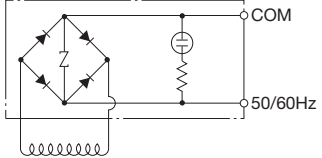


For sub plate SA-G03

Mounting bolt	Model No.	E	Weight
M6	MSA-03-10	3/8	2.3kg
	MSA-03X-10	1/2	
M8	MS-03-30	3/8	
	MS-03X-30	1/2	

M6 gasket surface dimensions
 (ISO 4401-05-04-0-05
 (JIS B 8355 D-05-04-0-05))

● Connectors

Model No.	Wiring	Electrical Circuit Diagram
SA-G01-***-C* 31 SA-G03-D* (J)21 (EA41-1A)	 <p>PG11</p> <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>	 <p>(In the case of D*: ±)</p>
SA-G01-***-R-C* 31 SA-G03 (J)21 (EA41-R*-1C)		
SA-G01-***-GR-C* 31 SA-G03 (J)21 (EA41-GRC*-1C)		
SA-G01-***-R-D* 31 SA-G03 (J)21 (EA41-DR*-1C)	 <p>PG11</p> <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>	
SA-G01-***-GR-D* 31 SA-G03 (J)21 (EA41-GRD*-1C)		
SA-G01-***-E* 31 SA-G03 (J)21 (EA42-1B)	 <p>Power supply terminal</p>	
SA-G01-***-R-E* 31 SA-G03 (J)21 (EA42-R*-1B)	 <p>G(Previously PF)1/2</p> <p>Connect the power supply to the terminals on the board. When ground connection is required, remove the board and use the ⊕ terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals.</p>	

Symbols in parentheses indicate connector configuration.

Note) 1. Asterisks in the connector configuration and power supply symbols are fillers for the voltage symbol (1 or 2).

2. The connector cord diameter is ϕ 8 to ϕ 10. Anything outside this range causes water tightness to be lost.

3. The orientation of the connectors can be changed in 90° increments by changing the terminal block.

4. The cover cannot be removed unless the installation screws are removed.

5. When J is specified for the auxiliary symbol, a G screw conversion adapter is attached to the connector, and the wiring port is a G (previously PF) 1/2 screw (standard: PG11). EA42 and EA42-R* also have a G (previously PF) wiring port.

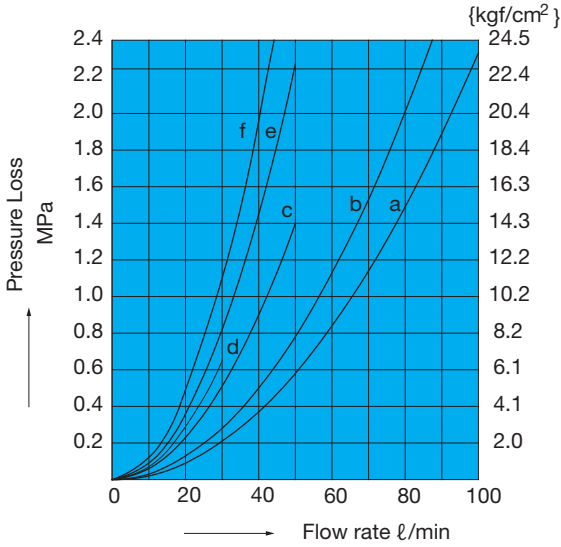
6. Use M3 for round type and Y type solderless terminals.

7. Tighten the M3 screws that secure connectors and terminals to a torque of 0.3 to 0.5N·m (3.1 to 5.1kgf·cm).

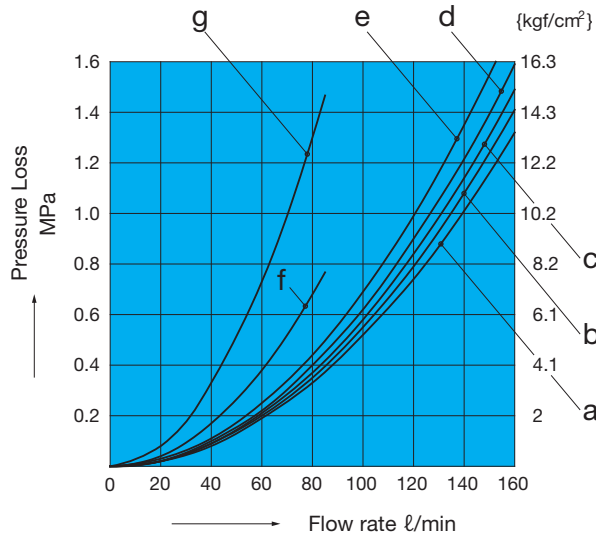
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SA-G01	A2X, H2X, E2X	d	d	-	-	-
	A3X, H3X	b	b	b	b	-
	E3X	b	b	b	b	-
	A3Z, H3Z, E3Z	a	a	a	a	-
	A4, H4, C4	a	a	a	a	a
	A5, H5, C5, C6S	b	b	b	b	-
	C1, C1S	b	b	a	b	-
	C2	a	b	b	b	-
	C6	b	b	a	a	-
	C7Y	f	f	e	e	c
	C8	a	f	b	e	c
C9	a	a	b	b	-	



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SA-G03	A2X, H2X, E2X	e	e	-	-	-
	A5	-	c	c	-	-
	H5	c	-	-	c	-
	A3X, H3X, E3X	c	c	d	d	-
	A3Z, H3Z	a	a	d	d	-
	E3Z	b	b	a	a	-
	C1	c	c	a	c	-
	C2	a	c	c	c	-
	A4, H4, C4	a	a	a	a	a
	C5, C1S, C6S	c	c	c	c	-
	C6	c	c	a	a	-
	C7Y	g	g	g	g	f
	C8	a	g	a	g	f
C9	a	a	c	c	-	

Switching Response Time

Model No.	Response Time (sec)		Measurement Conditions
	Solenoid ON	Spring Return	
SA-G01-**-*(GR)-C*-31	0.02 to 0.03	0.02 to 0.03	14MPa {143kgf/cm ² } 30l/min
SA-G01-**-*(GR)-D*-31	0.03 to 0.04	0.02 to 0.04	
SA-G01-**-*(R)-E*-31	0.03 to 0.04	0.07 to 0.10	
SA-G01-**-*(GR)-D*-31	0.07 to 0.10	0.04 to 0.07	
SA-G01-**-*(R)-E*-31	0.07 to 0.10	0.10 to 0.15	
SA-G03-**-*(GR)-C*-J21	0.02 to 0.03	0.02 to 0.03	14MPa {143kgf/cm ² } 70l/min
SA-G03-**-*(GR)-D*-J21	0.06 to 0.09	0.03 to 0.05	
SA-G03-**-*(R)-E*-J21	0.07 to 0.10	0.10 to 0.15	
SA-G03-**-*(GR)-D*-J21	0.13 to 0.15	0.08 to 0.15	
SA-G03-**-*(R)-E*-J21	0.10 to 0.15	0.15 to 0.20	

Note 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

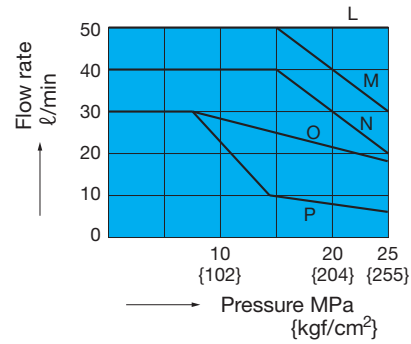
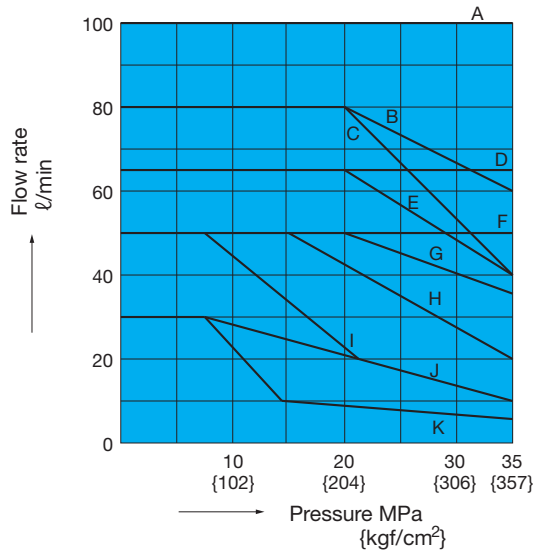
Pressure – Flow Volume Allowable Value

Size	Standard Form, with AC, DC solenoid		
	SA-G01-**-R**-31		
Operation Example			
Operation Symbol			
A2X, H2X	-	K	K
E2X	-	J	J
A3X, H3X	B	K	K
E3X	A	J	J
A3Z, H3Z	D	D	D
E3Z	D	D	D
A5	A	-	I
H5	A	I	-
C1, C6	Note1) C(E)	I	I
C1S, C5, C6S	A	I	I
C2, C9	A	K	K
A4	F	F	F
H4	F	F	F
C4	F	F	F
C7Y, C8	Note2) G(H)	K	K

Size	Shockless Type, with DC solenoid		
	SA-G01-**-FR**-31		
Operation Example			
Operation Symbol			
A2X, H2X	-	P	P
E2X	-	O	O
A3X, H3X	L	P	P
E3X	L	O	O
A3Z, H3Z	L	L	L
E3Z	L	L	L
A5	L	-	P
H5	L	P	-
C1, C6	M	P	P
C1S, C2, C5, C6S, C9	L	P	P
A4, H4	L	L	L
C4	L	L	L
C7Y, C8	N	P	P

Note) 1. Letter in parentheses is for AC solenoid.

2. Letter in parentheses is for solenoid with built-in rectifier, but without Quick Return, and for DC solenoid with surge voltage absorbing diode on the electrical circuit.



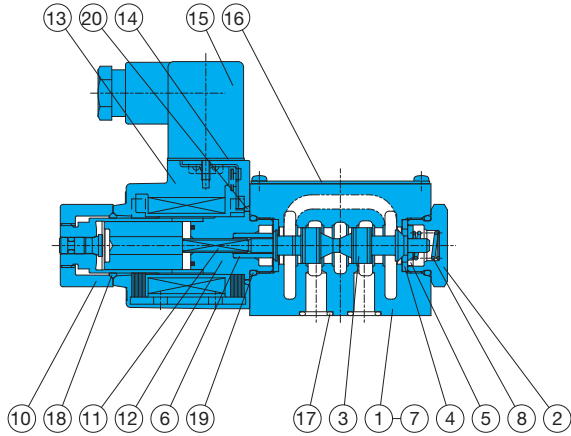
Pressure – Flow Volume Allowable Value

Model No.	Standard Form, with AC, DC solenoid			Standard Form, with DC solenoid		
	SA-G03-**-C*-J21			SA-G03-**-**-J21		
Operation Example						
Operation Symbol						
A2X	-	F	E	-	G	H
H2X	-	E	F	-	H	G
E2X	-	C	C	-	D	D
A3X	A	E	E	A	F	H
H3X	A	E	E	A	H	F
A3Z	A	A	C	A	D	D
H3Z	A	C	A	A	D	D
E3X, E3Z	A	C	C	A	D	D
A5	A	-	D	A	-	G
H5	A	D	-	A	G	-
C1S, C5, C6S	A	D	D	A	G	G
C1, C6	A	D	D	B	G	G
C2	A	G	D	A	I	G
A4, H4, C4	A	A	A	A	A	A
C9	A	G	G	A	I	I
C7Y, C8	B	B	B	Note1) C(E)	C(E)	C(E)
Model No.	Shockless Type, with DC solenoid					
	SA-G03-**-F**-J21					
Operation Example						
Operation Symbol						
A2X	-	E	F			
H2X	-	F	E			
E2X	-	C	C			
A3X	A	D	F			
H3X	A	F	D			
A3Z	A	C	C			
H3Z	A	C	C			
E3X, E3Z	A	C	C			
A5	A	-	E			
H5	A	E	-			
C1, C1S, C5, C6, C6S	A	E	E			
C2	A	G	E			
A4, H4, C4	A	A	A			
C9	A	G	G			
C7Y, C8	Note1) B(H)	B(H)	B(H)			

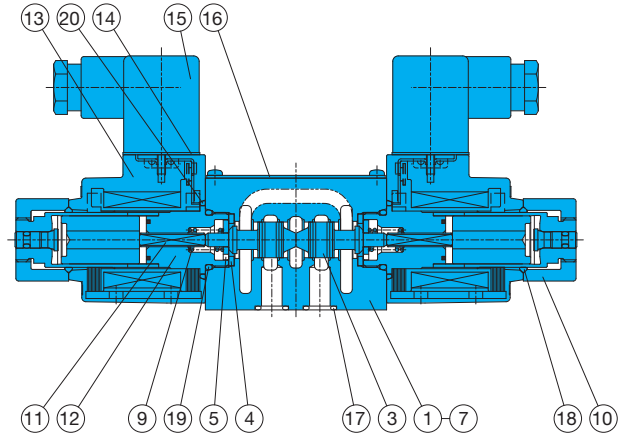
- Note) 1. Letter in parentheses is for solenoid with built-in rectifier (E*), but without Quick Return, and for DC solenoid (D*) with surge voltage absorbing diode on the electrical circuit.
 2. There is no shockless type for the AC solenoid (C*), so use a solenoid with built-in rectifier (E*) when shockless operation is required with an AC power supply.
 3. The maximum flow rate is the allowable value of each port.

Cross-sectional Drawings

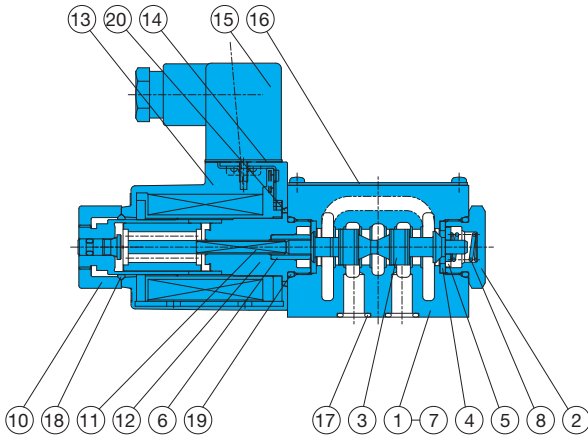
SA-G01-A**-C*-31



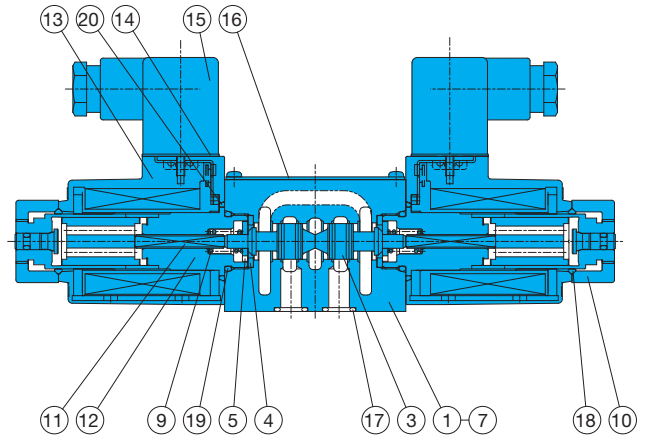
SA-G01-C**-C*-31



SA-G01-A**-D/E*-31



SA-G01-C**-D/E*-31



List of Sealing Parts

Part No.	Part Name	Part Number	Q'ty	
			Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)	4	4
18	O-ring	NBR-70-1 P20	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

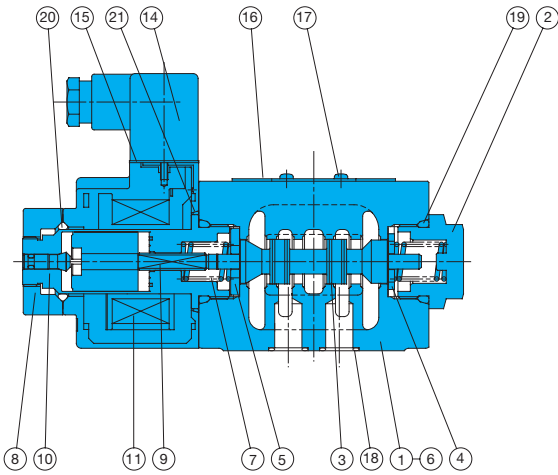
Single Solenoid	Double Solenoid
EDCS-A	EDCS-C

Part No.	Part Name	Part No.	Part Name
1	Body	11	Rod
2	Plug	12	Solenoid guide
3	Spool	13	Solenoid coil
4	Retainer A	14	Packing
5	Retainer B	15	Connector
6	Spring pin	16	Nameplate
7	Spacer	17	O-ring
8	Spring A	18	O-ring
9	Spring C	19	O-ring
10	Nut	20	O-ring

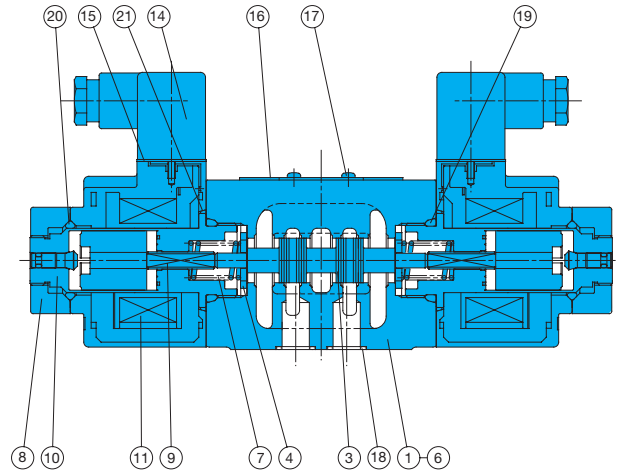


Cross-sectional Drawings

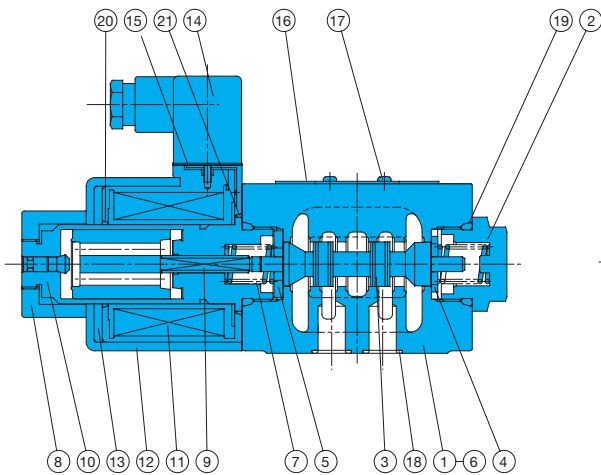
SA-G03-A**-C*-(J)21



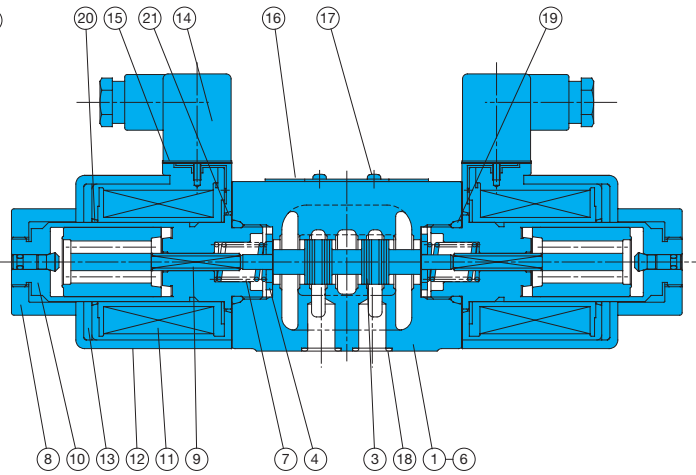
SA-G03-C**-C*-(J)21



SA-G03-A**-D/E*-(J)21



SA-G03-C**-D/E*-(J)21



List of Sealing Parts

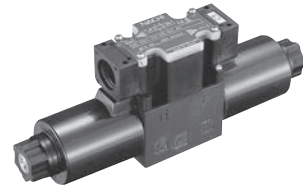
Part No.	Part Name	Type/Part Number		Q'ty	
		AC SOL.	DC SOL.	Single Solenoid	Double Solenoid
18	O-ring	AS568-014(NBR-90)		5	5
19	O-ring	NBR-90 P28		2	2
20	O-ring	NBR-70-1 P26	AS568-026(NBR-70-1)	1	2
21	O-ring	AS568-029(NBR-70-1)		1	2

Note) The materials and hardness of the O-ring conform with JIS B2401.

Part No.	Part Name	Part No.	Part Name
1	Body	11	Solenoid coil
2	Plug	12	Coil case
3	Spool	13	Coil yoke
4	Retainer	14	Connector
5	Retainer B	15	Connector packing
6	Spacer	16	Nameplate
7	Spring	17	Screw
8	Nut	18	O-ring
9	Rod	19	O-ring
10	Solenoid guide	20	O-ring
		21	O-ring

Seal Kit Number

AC SOL.		DC SOL.	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
ECBS-AA	ECBS-CA	ECBS-AD	ECBS-CD



SE Series (Wiring System: Central Terminal Box) Lower Power Solenoid Valve

40 to 60ℓ/min
10 to 16MPa

Features

① Low current, low power

The SE series magnetic switching valve's solenoid has significantly lower power consumption.

② Directly drivable by a programmable controller

Low-current operation means not only allows direct drive by a programmable controller (PC) output circuit, it also enables the use of a compact and simple control circuit.

③ Little coil temperature rise

Low power operation means there is little heat generated from the coil, which minimizes the effects of heat on mechanisms. Even with the AC solenoid, there is little chance of coil burnout.

④ With M12-4 pin connector (option)

Makes it easier to interface with open networks like Device Net. This connector streamlines wiring work. The diode for preventing current back surge is

built in to the terminal box to protect the slave unit connection. (With M12-4 pin connector)

⑤ Global compliance (G01 size)

Meets overseas safety standards TÜV (CE marking). Can be used safely around the world.

Specifications

Operation Symbol	JIS Symbol	SE-G01-**-*(G)R-**-40		SE-G03-**-GR-**-*(J)30	
		Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)
A2X		30	16 {163}	40	10 {102}
A3X		30		50	
H3X		40		-	
E3X		30		50	
C4		30		60	
C5		40			
C6		40			

Note) The maximum flow rate of each valve depends on the pressure. For details, see page E-30.

● Handling

- In order to realize the full benefits of the solenoid valve, configure piping so oil is constantly supplied to the T(DR) port.
- Ensure that surge pressure in excess of the maximum allowable back pressure can be accidentally at the T port.

③ Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or oneway valve.

④ Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.

⑤ When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.

⑥ Use the SS series solenoid valve if using flame resistant operating fluid.

⑦ Be sure to note the allowable pressure range of the coil being used.

⑧ Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.

⑨ When using a detent type (E3X), provide constant energization when secure maintenance of the switching position is required.

⑩ Note that manual pin operating pressure changes in accordance with tank line back pressure.

⑪ If you do not select the option with the M12-4 pin connector, current back surge may occur because there is no solenoid in the central terminal box. Therefore, install solenoid valves to protect against current back surge on both ends of the coil in the output circuit of the programmable controller (PC) if directly operating the solenoid valves. (Recommended diode: Hitachi V07J or equivalent)

● Solenoid Assembly Specifications

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SE-G01				For SE-G03			
				Solenoid Coil Type	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)	Solenoid Coil Type	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)
Built-in rectifier type AC	E1	AC100	50	EED64-E1	0.08	7.0	80 to 120	SLH1-03B-R1-01	0.06	5.8	80 to 120
			60								
DC	D2	DC24	-	EED64-D2	0.2	4.8	21.6 to 26.4	SLH1-03B-D2-01	0.2	4.8	21.6 to 26.4

Solenoid Type		SE-G01		SE-G03		
		DC Solenoid	Internal DC solenoid for rectifier	DC Solenoid	Internal DC solenoid for rectifier	
		D2	E1	D2	E1	
Maximum Working Pressure	P, A, B Ports	16MPa{163kgf/cm ² }		10MPa{102kgf/cm ² }		
Maximum Allowable Backpressure	T port	16MPa{163kgf/cm ² }		10MPa {102kgf/cm ² } (In the case of 2MPa {21kgf/cm ² } operation symbol E3X)		
Changeover Frequency (per minute)		120		120		
Standard	Indicator light Surgeless	GR	R	GR		
Weight (kg)	Double Solenoid	2.2		3.5		
	Single Solenoid	1.7		3.3		
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C0920 IP64 (Dust-tight, Splash proof)		JIS C0920 IP65 (Dust-tight, Waterjet-proof)		
	Ambient Temperature	-20 to 50°C		-10 to 50°C		
	Operating Fluid	Temperature Range	-20 to 70°C		0 to 65°C	
		Kinematic Viscosity Range	15 to 300mm ² /s			
	Filtration	25 μm or less				
Bundled Accessories	Mounting bolt	Refer to page D-93 for bolt lengths for usage of M5 x 45 4-module valves.		Refer to page E-31 for bolt lengths for usage of M6 x 40 (M8 x 40) 4-module valves.		
	Tightening Torque	5 to 7N·m {51 to 71kgf·cm}		M6 10 to 13N·m{102 to 133kgf·cm} M8 18 to 21N·m{184 to 214kgf·cm}		

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

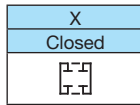
SE - G 03 - A 3 X - GR - D2 - J30

Design number
40: For 01 size
J30: 03 size for mounting bolt M6 (30 if mounting bolt is M8)

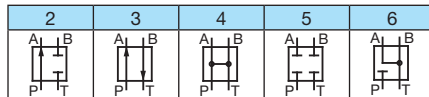
Power supply
D: DC D2=DC24V
E: For AC (joint 50/60 Hz inside rectifier) E1=AC100V

Auxiliary symbol
GR: Surgeless type with indicator (applicable for power supply D2 only)
R: With indicator light (applicable for power supply E1 only)
V: With M12-4 pin connector, load side - common (applicable for power supply D2 only)
W: With M12-4 pin connector, load side + common (applicable for power supply D2 only)

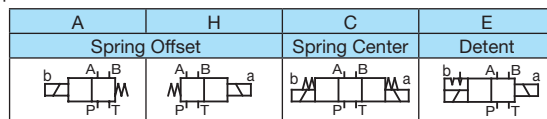
Transition Flow Path (Specify for A2X, A3X only)



Center valve position flow path



Operation Method



Nominal pipe diameter
01 size
03 size

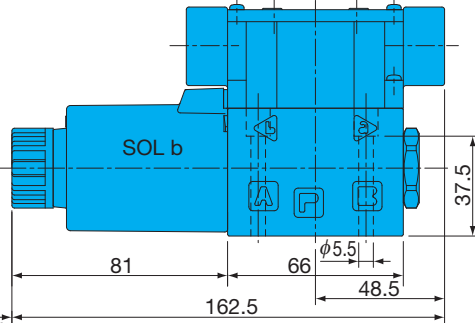
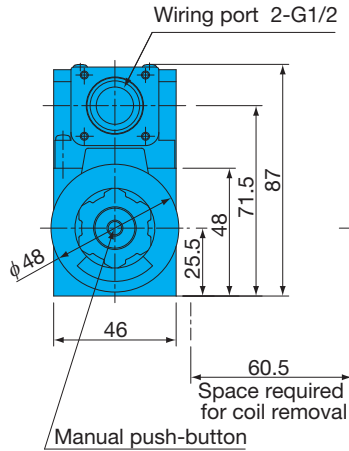
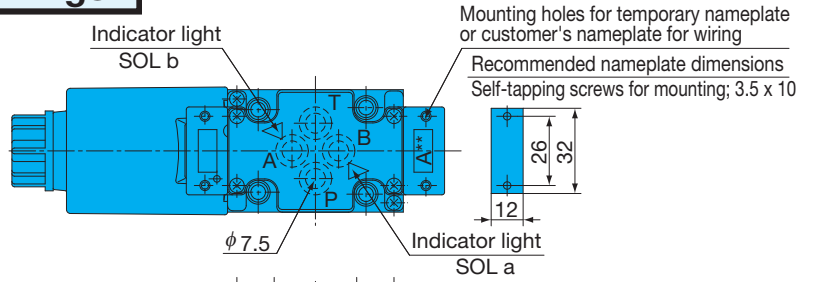
Mounting method
G: Gasket type

Central terminal box with low-power solenoid valve

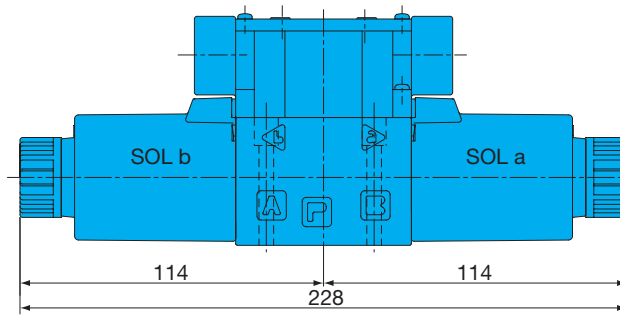
Installation Dimension Drawings

SE-G01-A***-(G)R**-40
SE-G01-H***-(G)R**-40

Note) For SE-G01-H3X-(G)R**-40, the solenoid is on the opposite side as that shown in the diagram (SOL.a).



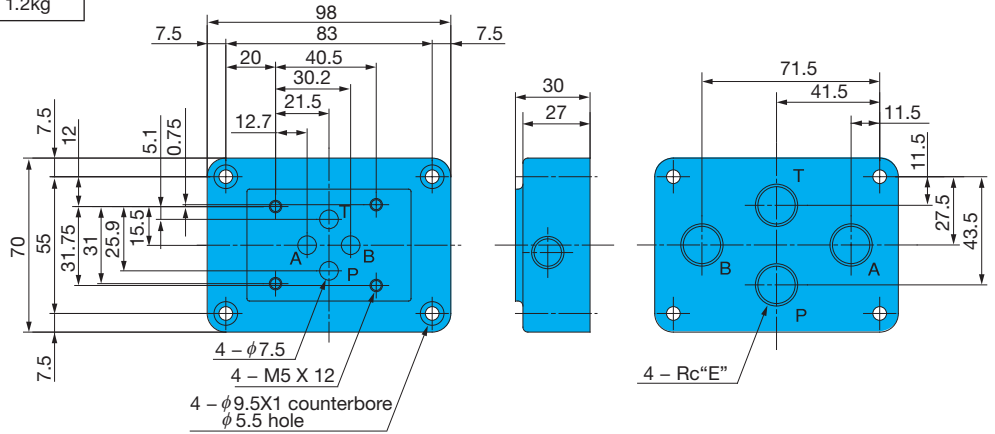
SE-G01-C**-(G)R**-40
SE-G01-E3X-(G)R**-40



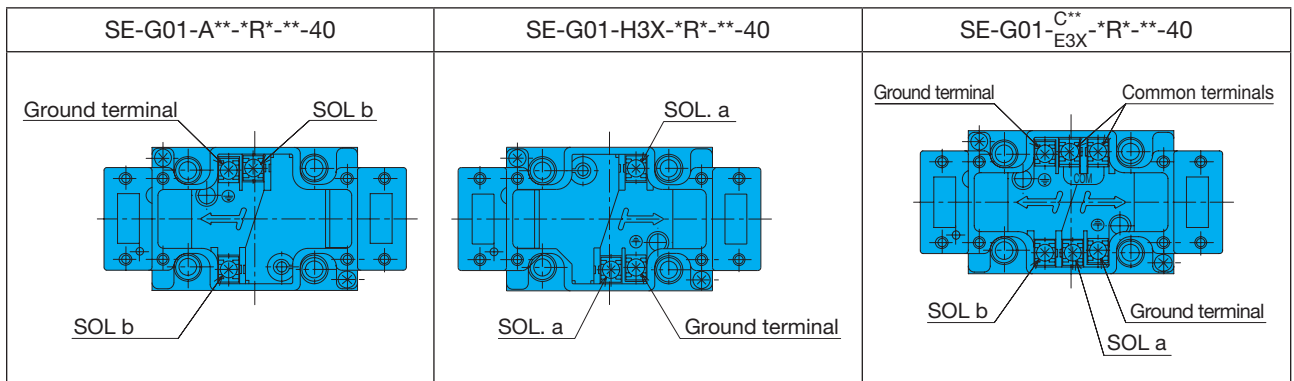
For sub plate SE-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

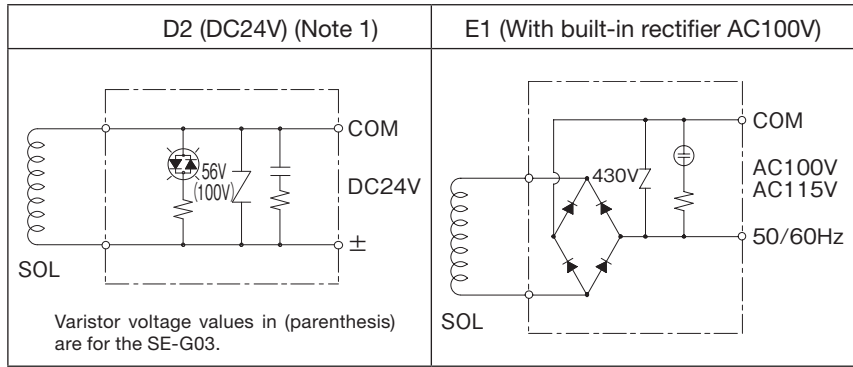
Gasket Surface Dimensions
ISO 4401-03-02-0-05
(JIS B 8355 D-03-02-0-05)



Wiring diagram for central terminal box kit

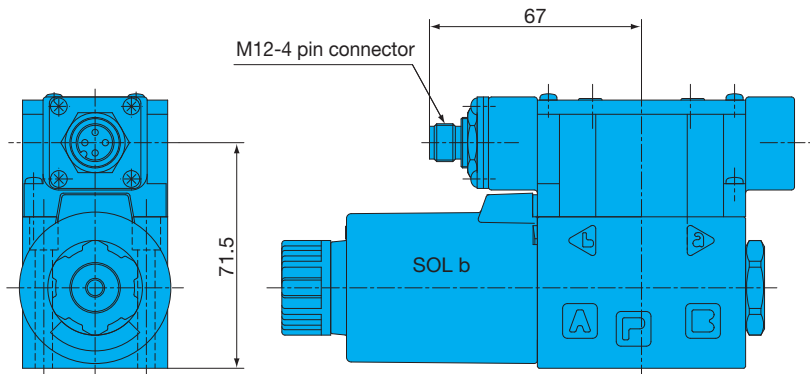
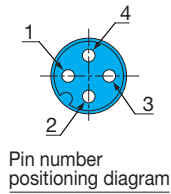


Electrical circuit diagram for central terminal box kit



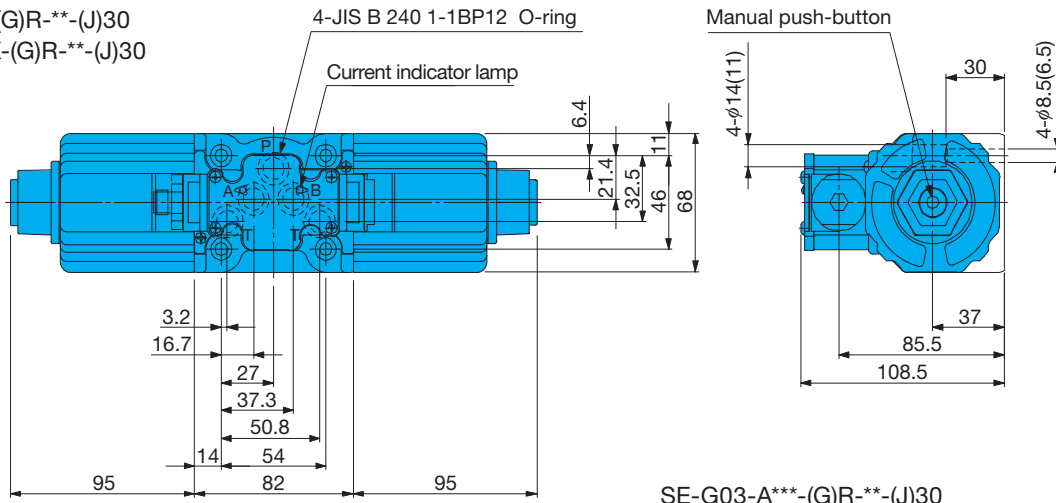
Note 1) Install D2 specification solenoid valves to protect against current back surge on both ends of the coil in the output circuit of the programmable controller (PC) if directly operating the solenoid valves.

With M12-4 pin connector
SE-G01**-GRV-D2-40
SE-G01**-GRW-D2-40

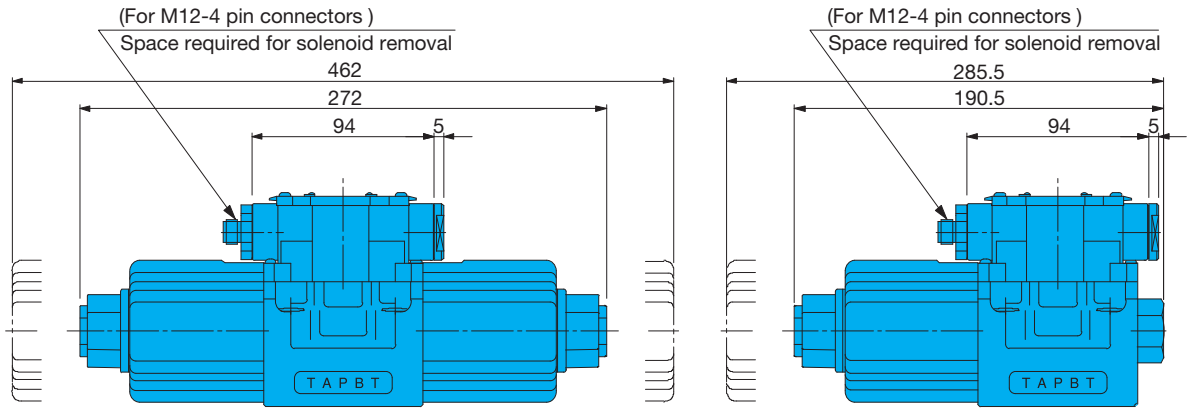


	Pin number position	Electrical Circuit Diagram	
		Operation Symbol C*	Operation Symbol A*, H*
Type V	<p style="text-align: center;">4: SOL. b(+) (Type A, C) 4: SOL. a(+) (Type H)</p> <p style="text-align: center;">2: SOL. a(+) (For Type C)</p> <p style="text-align: center;">3: COM(-)</p>	<p style="text-align: center;">PIN No. 2 SOL. a(+)</p> <p style="text-align: center;">PIN No. 3 COM(-)</p> <p style="text-align: center;">PIN No. 1 Not used</p> <p style="text-align: center;">PIN No. 4 SOL. b(+)</p>	<p style="text-align: center;">PIN No. 4 SOL. a(+): Type H SOL. b(+): Type A</p> <p style="text-align: center;">PIN No. 3 COM(-)</p> <p style="text-align: center;">PIN No. 1, 2 are not used</p>
Type W	<p style="text-align: center;">4: SOL. b(-) (Type A, C) 4: SOL. a(-) (Type H)</p> <p style="text-align: center;">1: COM(+)</p> <p style="text-align: center;">4: SOL. a(-) (Type C)</p> <p style="text-align: center;">3: Not used</p>	<p style="text-align: center;">PIN No. 2 SOL. a(-)</p> <p style="text-align: center;">PIN No. 1 COM(+)</p> <p style="text-align: center;">PIN No. 3 Not used</p> <p style="text-align: center;">PIN No. 4 SOL. b(-)</p>	<p style="text-align: center;">PIN No. 4 SOL. a(-): Type H SOL. b(-): Type A</p> <p style="text-align: center;">PIN No. 1 COM(+)</p> <p style="text-align: center;">PIN No. 2, 3 are not used</p>

SE-G03-C*(G)R**(J)30
SE-G03-E3X(G)R**(J)30



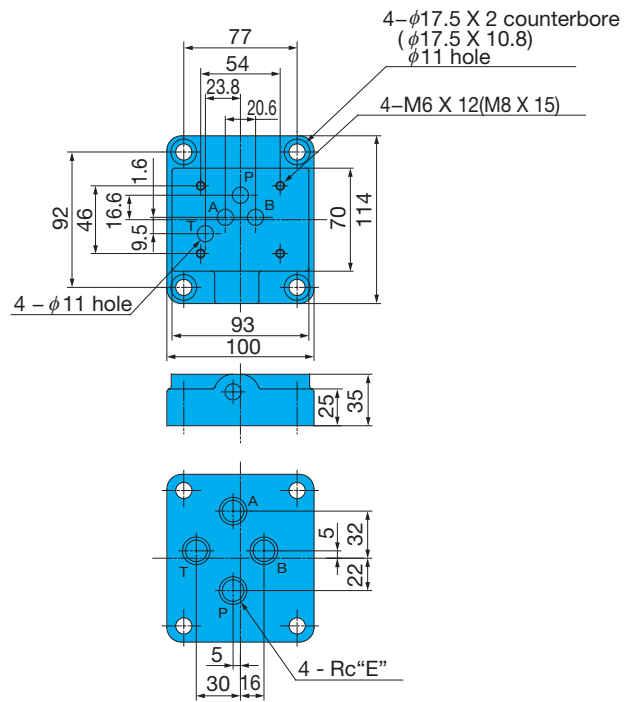
SE-G03-A***-(G)R**(J)30



For sub plate SE-G03

Mounting bolt	Model No.	E	Weight
M6	MSA-03-10	3/8	2.3kg
	MSA-03X-10	1/2	
M8	MS-03-30	3/8	
	MS-03X-30	1/2	

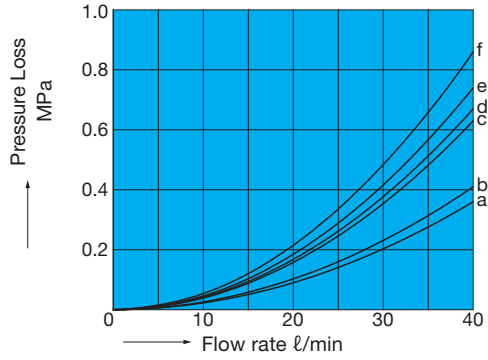
M6 gasket surface dimensions
 (ISO 4401-05-04-0-05)
 (JIS B 8355 D-05-04-0-05)



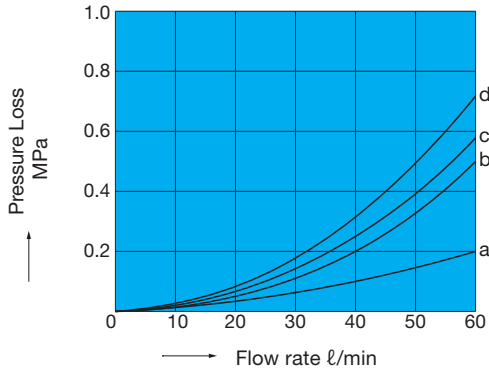
Performance Curves

Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics



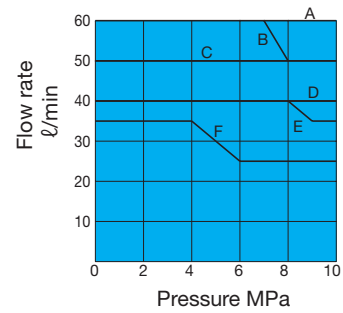
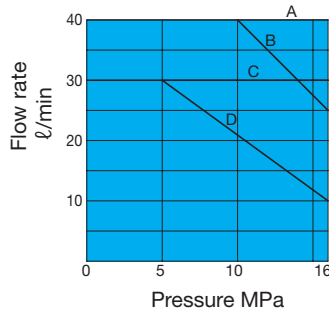
Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SE-G01	A2X	d	f	-	-	-
	A3X	f	f	e	e	-
	H3X	f	f	e	e	-
	E3X	c	c	e	e	-
	C4	b	b	b	b	d
	C5	e	e	d	d	-
C6	f	f	a	a	-	



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SE-G03	A2X	d	d	-	-	-
	A3X	d	d	d	d	-
	E3X	d	d	c	c	-
	C4	c	c	a	a	b
	C5	d	d	d	d	-
	C6	d	d	b	b	-

Pressure - Flow Volume Allowable Value

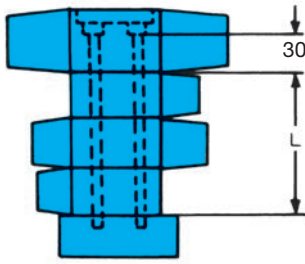
Pump Type	SE-G01			SE-G03		
	Operation Example	Operation Symbol	Operation Symbol	Operation Symbol	Operation Symbol	Operation Symbol
A2X						
A3X	A	D	D	C	E	A
H3X	A	D	D	-	-	-
E3X	A	C	C	D	D	C
C4	C	C	C	C	F	C
C5	A	D	D	A	B	B
C6	B	D	D	A	B	B



Note) 1. The maximum flow rate is the value when a rated 90%V is applied following solenoid temperature rise and saturation.
2. The maximum flow rate is the allowable value of each port.

Installation bolts

Refer to the following table for length of installation bolts for SE-G03 size. (Refer page D-93 for length of installation bolts for SE-G01 size.)

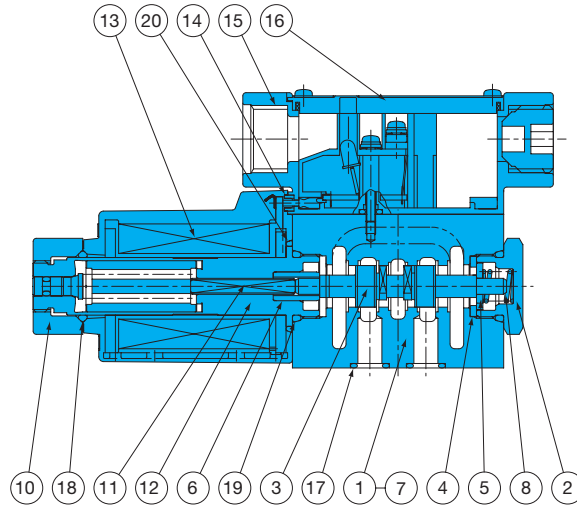


Type	Dimensions L	Bolt length
Hexagon socket head bolt	0 (Solenoid only)	40
	55	95
	110	150

Type	Dimensions L	Bolt length
Stat bolt	55	106
	110	161
	165	216
	220	271

Cross-sectional Drawings

SE-G01-A3X-(G)R-**-40



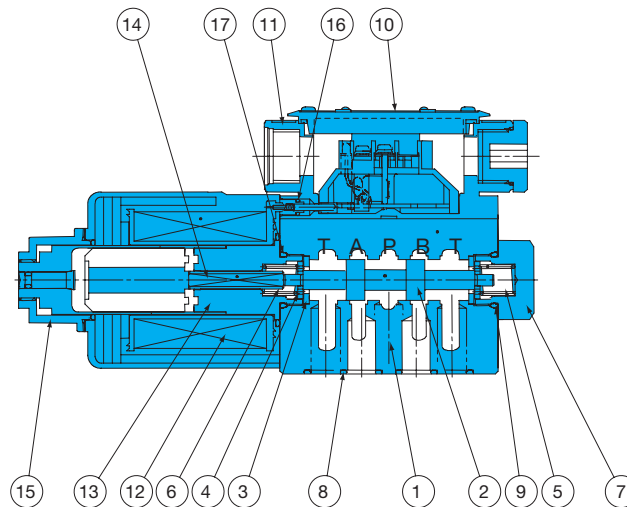
Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer A
5	Retainer B
6	Spring pin
7	Spacer
8	Spring A
9	Spring C
10	Nut
11	Rod
12	Solenoid guide
13	Solenoid coil
14	Packing
15	Terminal box kit
16	Nameplate
17	O-ring
18	O-ring
19	O-ring
20	O-ring

List of Sealing Parts

Part No.	Part Name	SE-G01		
		Part Number	Q'ty	
			Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)	4	4
18	O-ring	NBR-70-1 P18	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

SE-G03-A3X-GR-**- (J)30



Part No.	Part Name
1	Body
2	Spool
3	Spacer
4	Holder
5	Spring
6	Spring
7	Plug
8	O-ring
9	O-ring
10	Nameplate
11	Terminal box kit
12	Solenoid coil
13	Solenoid guide
14	Rod
15	Nut
16	O-ring
17	O-ring

List of Sealing Parts

Part No.	Part Name	SE-G03		
		Part Number	Q'ty	
			Single Solenoid	Double Solenoid
8	O-ring	NBR-90 P12	5	5
9, 17	O-ring	NBR-90 P18	2	2
16	O-ring	NBR-70-1 P3	2	4

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Seal Kit Number

SE-G01		SE-G03	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
EEDS-01A	EEDS-01C	EECS-03A	EECS-03C



SED Series (Wiring System: DIN Connector Type) Lower Power Solenoid Valve

40ℓ/min
16MPa

Features

① Low current, low power

The SED series magnetic switching valve's solenoid has significantly lower power consumption.

② Directly drivable by a programmable controller

Low-current operation means not only allows direct drive by a programmable controller (PC) output circuit, it also enables the use of a compact and simple control circuit.

③ Little coil temperature rise

Low power operation means there is little heat generated from the coil, which minimizes the effects of heat on mechanisms. Even with the AC solenoid, there is little chance of coil burnout.

④ Easy coil replacement

A DIN connector type coil enables one-touch coil replacement.

⑤ Global compliance (G01 size)

Meets overseas safety standards TÜV (CE marking). Can be used safely around the world.

Specifications

Operation Symbol	JIS Symbol	SED-G01-**-*(G)R-**-40	
		Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)
A2X		30	16 {163}
A3X			
H3X		40	
E3X			
C4		30	
C5			
C6			

Note) The maximum flow rate of each valve depends on the pressure. For details, see page E-36.

● Handling

① In order to realize the full benefits of the solenoid valve, configure piping so oil is constantly supplied to the T(DR) port.

② Ensure that surge pressure in excess of the maximum allowable back pressure can be accidentally at the T port.

③ Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or oneway valve.

④ Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.

⑤ When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.

⑥ Use the SA series solenoid valve if using flame resistant operating fluid.

⑦ Be sure to note the allowable pressure range of the coil being used.

⑧ Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.

⑨ When using a detent type (E3X), provide constant energization when secure maintenance of the switching position is required.

⑩ Note that manual pin operating pressure changes in accordance with tank line back pressure.

⑪ If you select the DC solenoid (D2 power model), reverse surge voltage occurs because there is no diode mounted in the DIN connector.

Therefore, install solenoid valves to protect against current back surge on both ends of the coil in the output circuit of the programmable controller (PC) if directly operating the solenoid valves. (Recommended diode: Hitachi V07J or equivalent)

● Solenoid Assembly Specifications

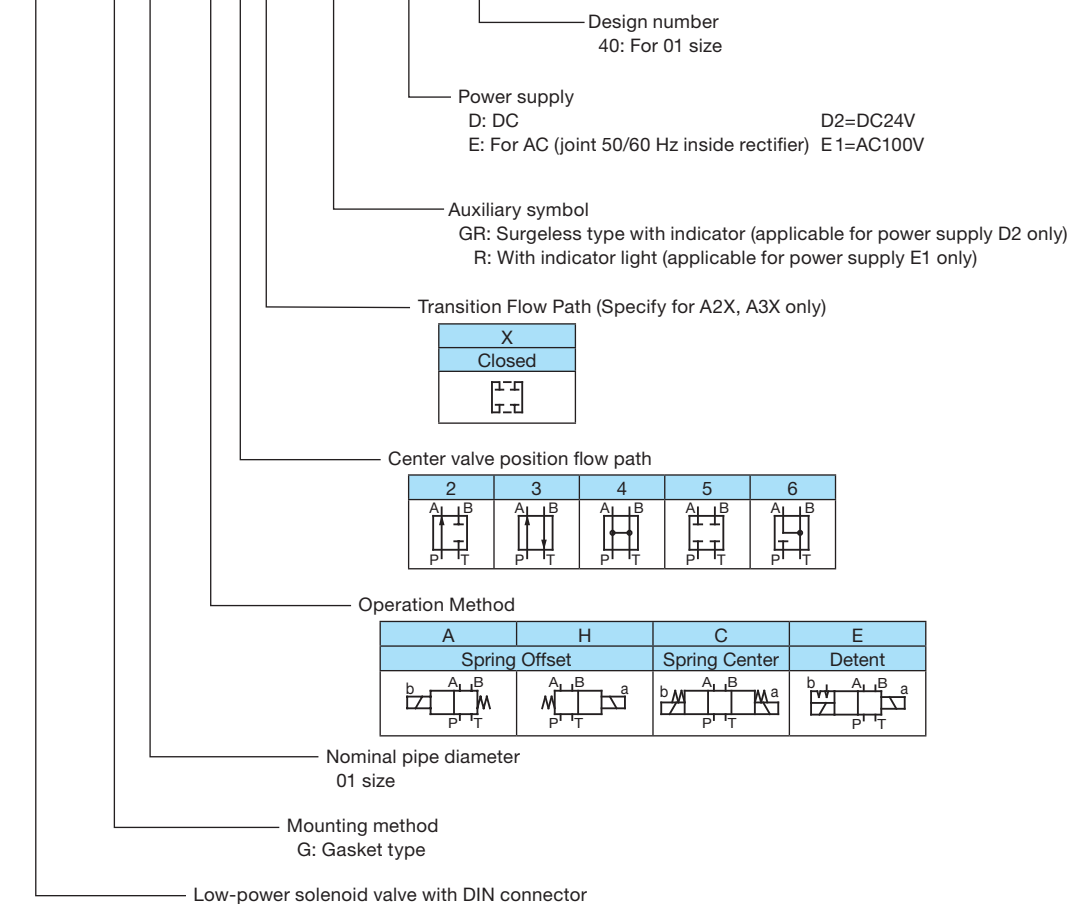
Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SED-G01			
				Solenoid Coil Type	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)
Built-in rectifier type AC	E1	AC100	50	EED64-E1D	0.08	7.0	80 to 120
			60				
DC	D2	DC24	-	EED64-D2D	0.2	4.8	21.6 to 26.4

Solenoid Type		SED-G01		
		DC Solenoid	Internal DC solenoid for rectifier	
		D2	E1	
Maximum Working Pressure	P, A, B Ports	16MPa{163kgf/cm ² }		
Maximum Allowable Backpressure	T port	16MPa{163kgf/cm ² }		
Changeover Frequency (per minute)		120		
Standard	Indicator light Surgeless	GR	R	
Weight (kg)	Double Solenoid	2.2		
	Single Solenoid	1.7		
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C0920 IP65 (Dust-tight, Waterjet-proof)		
	Ambient Temperature	-20 to 50°C		
	Operating Fluid	Temperature Range	-20 to 70°C	
		Kinematic Viscosity Range	15 to 300mm ² /s	
	Filtration	25 μm or less		
Bundled Accessories	Mounting bolt	Refer to page D-93 for bolt lengths for usage of M5 x 45 4-module valves.		
	Tightening Torque	5 to 7N·m {51 to 71kgf·cm}		

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Explanation of model No.

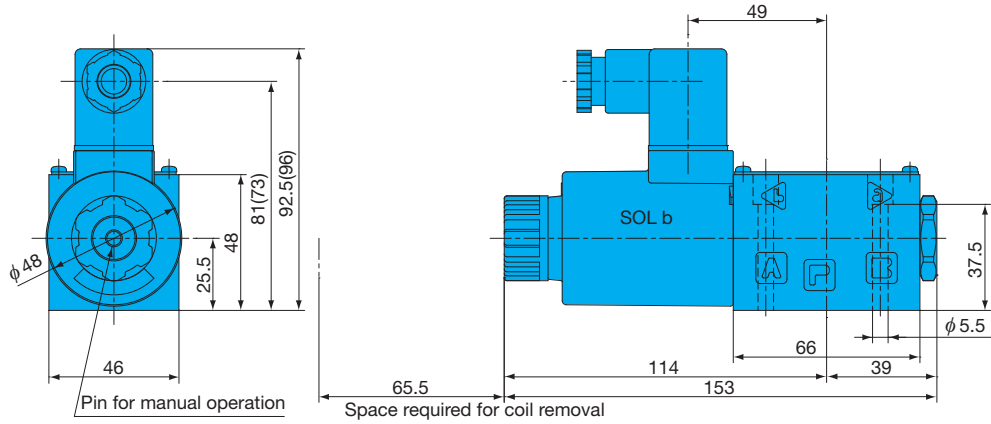
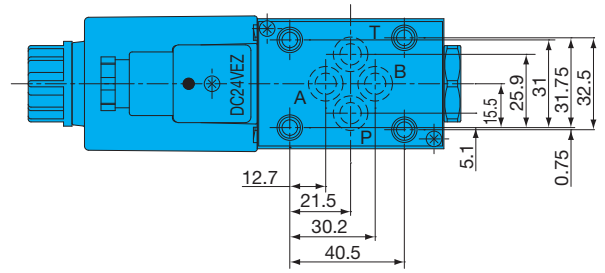
SED - G 01 - A 3 X - GR - D2 - 40



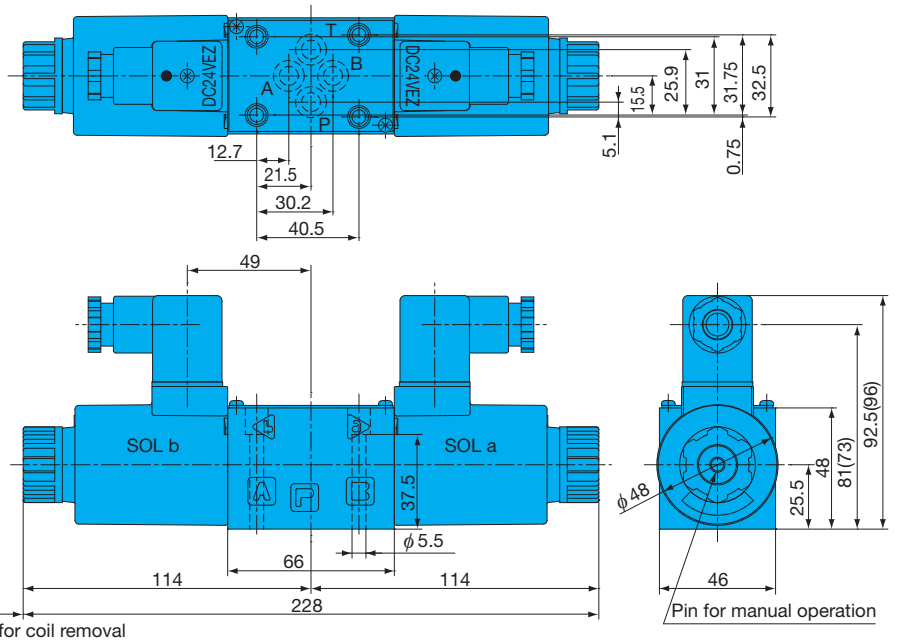
Installation Dimension Drawings

SED-G01-A***-(G)R**-40
 SED-G01-H***-(G)R**-40

Note) For SED-G01-H3X-(G)R**-40, the solenoid is on the opposite side as that shown in the diagram (SOL.a).



SED-G01-C**-(G)R**-40
 SED-G01-E3X-(G)R**-40

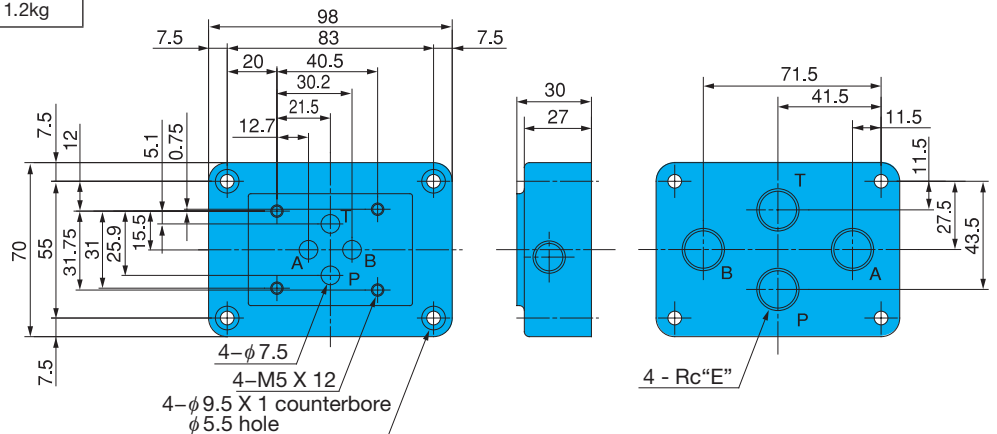


Note) Gasket surface dimensions and sub plate are the same as those for SS-G01. See page E-5 for more information.

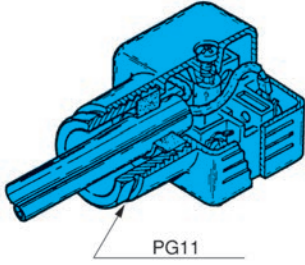
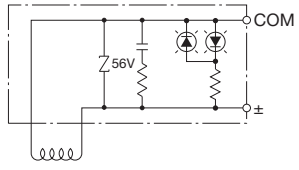
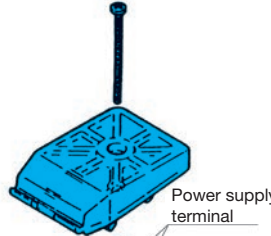
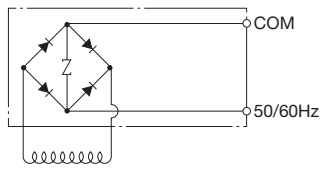
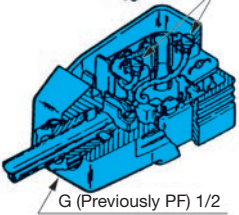
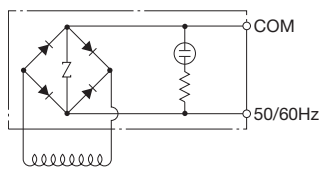
For sub plate SED-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
 ISO 4401-03-02-0-05
 (JIS B 8355 D-03-02-0-05)



●Connectors

Model No.	Wiring	Electrical Circuit Diagram
SED-G01-***-GR-D2-40 (EA41-EGRD2)	 <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>	
SED-G01-***-E1-40 (EA42-1B)	 <p>Connect the power supply to the terminals on the board.</p>	
SED-G01-***-R-E1-40 (EA42-R*-1B)	 <p>When ground connection is required, remove the board and use the ⊕ terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals.</p>	

Symbols in parentheses indicate connector configuration.

Note) 1. Asterisks in the connector configuration and power supply symbols are fillers for the voltage symbol (1 or 2).

2. The connector cord diameter is $\phi 8$ to $\phi 10$. Anything outside this range causes water tightness to be lost.

3. The orientation of the connectors can be changed in 90° increments by changing the terminal block.

4. The cover cannot be removed unless the installation screws are removed.

5. Use M3 for round type and Y type solderless terminals.

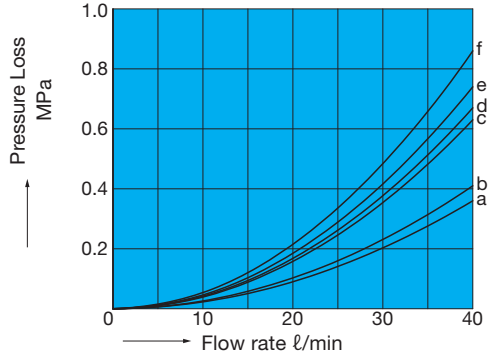
6. Tighten the M3 screws that secure connectors and terminals to a torque of 0.3 to 0.5N·m (3.1 to 5.1kgf·cm).



Performance Curves

Differential Hydraulic Fluid Kinematic Viscosity 32mm²/s

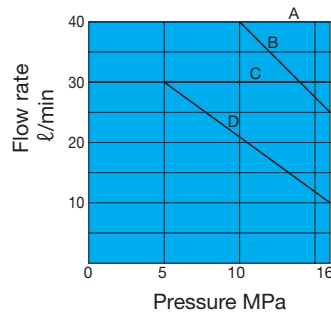
Pressure Loss Characteristics



Pump Type	Flow Path	P→A	P→B	A→T	B→T	P→T
SED-G01	A2X	d	f	-	-	-
	A3X	f	f	e	e	-
	H3X	f	f	e	e	-
	E3X	c	c	e	e	-
	C4	b	b	b	b	d
	C5	e	e	d	d	-
	C6	f	f	a	a	-

Pressure - Flow Volume Allowable Value

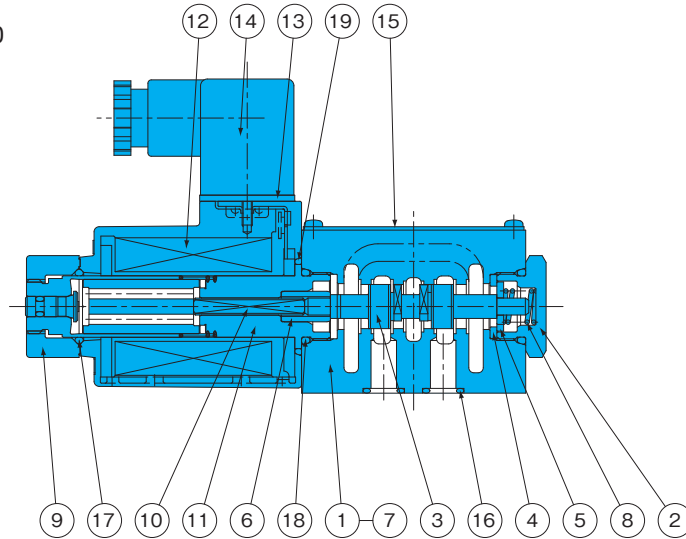
Pump Type	SED-G01		
Operation Example			
Operation Symbol			
A2X	-	D	D
A3X	A	D	D
H3X	A	D	D
E3X	A	C	C
C4	C	C	C
C5	A	D	D
C6	B	D	D



Note) 1. The maximum flow rate is the value when a rated 90%V is applied following solenoid temperature rise and saturation.
 2. The maximum flow rate is the allowable value of each port.

Cross-sectional Drawings

SED-G01-A3X-(G)R-**-40



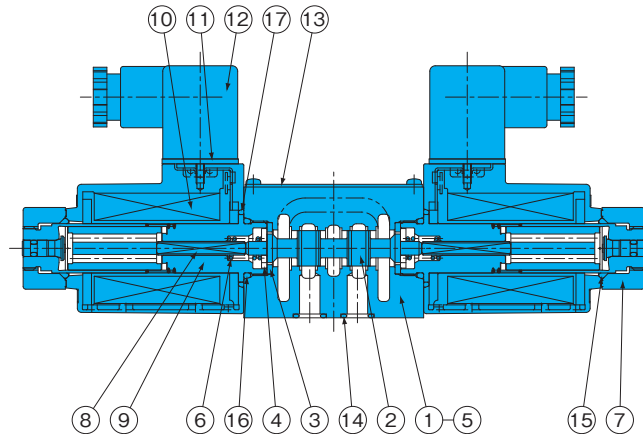
Part No.	Part Name
1	Body
2	Plug
3	Spool
4	Retainer A
5	Retainer B
6	Spring pin
7	Spacer
8	Spring A
9	Nut
10	Rod
11	Solenoid guide
12	Solenoid coil
13	Packing
14	Terminal box kit
15	Nameplate
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	O-ring

List of Sealing Parts

Part No.	Part Name	SED-G01		
		Part Number	Q'ty	
			Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)	4	4
18	O-ring	NBR-70-1 P18	1	2
19	O-ring	NBR-90 P18	2	2
20	O-ring	S-25(NBR-70-1)	1	2

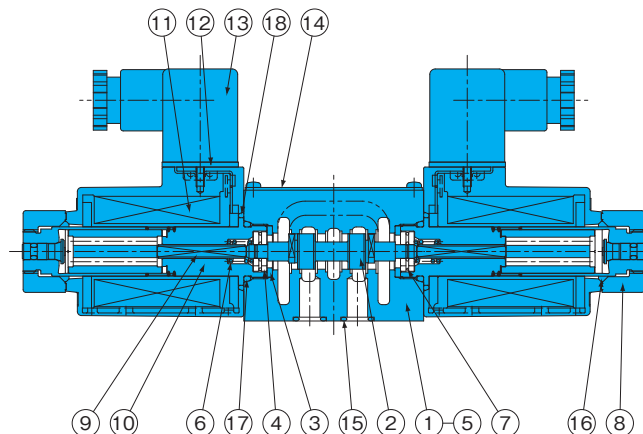
Note) The materials and hardness of the O-ring conforms with JIS B2401.

SED-G01-C*-(G)R-**-40



Part No.	Part Name
1	Body
2	Spool
3	Retainer A
4	Retainer B
5	Spacer
6	Spring C
7	Nut
8	Rod
9	Solenoid guide
10	Solenoid coil
11	Packing
12	Terminal box kit
13	Nameplate
14	O-ring
15	O-ring
16	O-ring
17	O-ring

SED-G03-A3X-GR-**-J)30



Part No.	Part Name
1	Body
2	Spool
3	Retainer A
4	Retainer B
5	Spacer
6	Spring C
7	Detent spring
8	Nut
9	Rod
10	Solenoid guide
11	Solenoid coil
12	Packing
13	Terminal box kit
14	Nameplate
15	O-ring
16	O-ring
17	O-ring
18	O-ring



SL Series (Wiring System: Central Terminal Box) Lower Power Solenoid Valve

30ℓ/min
7MPa

Features

- ① Very long life
The movable iron core of the wet type solenoid is immersed in oil, which keeps it lubricated and cushions it from impact and vibration, ensuring very long life.
- ② Low switching noise
The wet-type solenoid valve provides very low core switching noise, for quiet operation.
- ③ Low power consumption type.
The low power for the AC solenoid 9.6 W (60 Hz), DC solenoid 10 W contribute to energy conservation.
- ④ Easy connections
A special wiring box provides a COM port and indicator light as standard for simple wiring and maintenance.
- ⑤ Easy coil replacement
A plug-in type coil enables one-touch coil replacement.
- ⑥ Wide-ranging backward compatibility makes it simple to replace previous valve models with this one. Combining this valve with a modular valve contributes to the compact configuration of the overall device.
- ⑦ Global standard
Meets overseas safety standards (CE, UL, and CSA). It can be safely used anywhere in the world. Contact your agent for certified products.

Specifications

JIS Symbol	Operation symbol	Maximum flow rate (ℓ/min)
	-A5-	30
	-H5-	
	-A3X-	
	-H3X-	
	-E3X-	
	-C1-	
	-C2-	

JIS Symbol	Operation symbol	Maximum flow rate (ℓ/min)
	-C4-	30
	-C5-	
	-C6-	
	-C9-	
	-C6S-	
	-C7Y-	15

Solenoid Type		AC Solenoid		DC Solenoid	
		C1	C2	Built-in Rectifier	
				E1	D2
Maximum Working Pressure	P, A, B Ports	7MPa{71kgf/cm ² }			
Maximum Allowable Backpressure	T Port	7MPa{71kgf/cm ² }			
Changeover Frequency (per minute)		240		120	240
Standard	Indicator light	R			
Options	Surgeless	G		-	G
	With manual push-button	N			
	Quick Return	-		Q	-
Weight (kg)	Double Solenoid	1.5		2.0	
	Single Solenoid	1.2		1.5	
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP64 (Dust-tight, Splash-proof)			
	Operating Fluid	Ambient Temperature	-20 to 50°C		
		Temperature Range	-20 to 70°C		
		Kinematic Viscosity Range	15 to 300mm ² /s		
		Filtration	25 μm or less		
Mounting bolt		Hex bolt with hole of 12.9 strength classification M5 × 45 4 each			
Tightening Torque		5 to 7N·m{51 to 71kgf·cm}			

Note) Mounting bolts are not included.

● Handling

- 1 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T(R) port. Never use a stopper plug in the T(R) port.
- 2 Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- 3 Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- 4 Always keep the operating fluid clean. (contamination level: 12 or lower)
- 5 When using petroleum type operating fluid, use JIS K 2213 Class 1 or Class 2, or equivalent.
- 6 Use the SS series solenoid valve when using fire resistant hydraulic operating fluid.
- 7 Use this valve only within the allowable voltage range.
- 8 Do not allow the AC solenoid to become charged until you install the coil into the valve.
- 9 Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.
- 10 When using a detent type (E3X), use constant energization in order to securely maintain the switching position.
- 11 Note that manual pin operating pressure changes in accordance with tank line back pressure.
- 12 Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Maximum flow rate (ℓ/min)	Weight (kg)
MSA-01X-10	1/4	20	1.2
MSA-01Y-10	3/8	40	

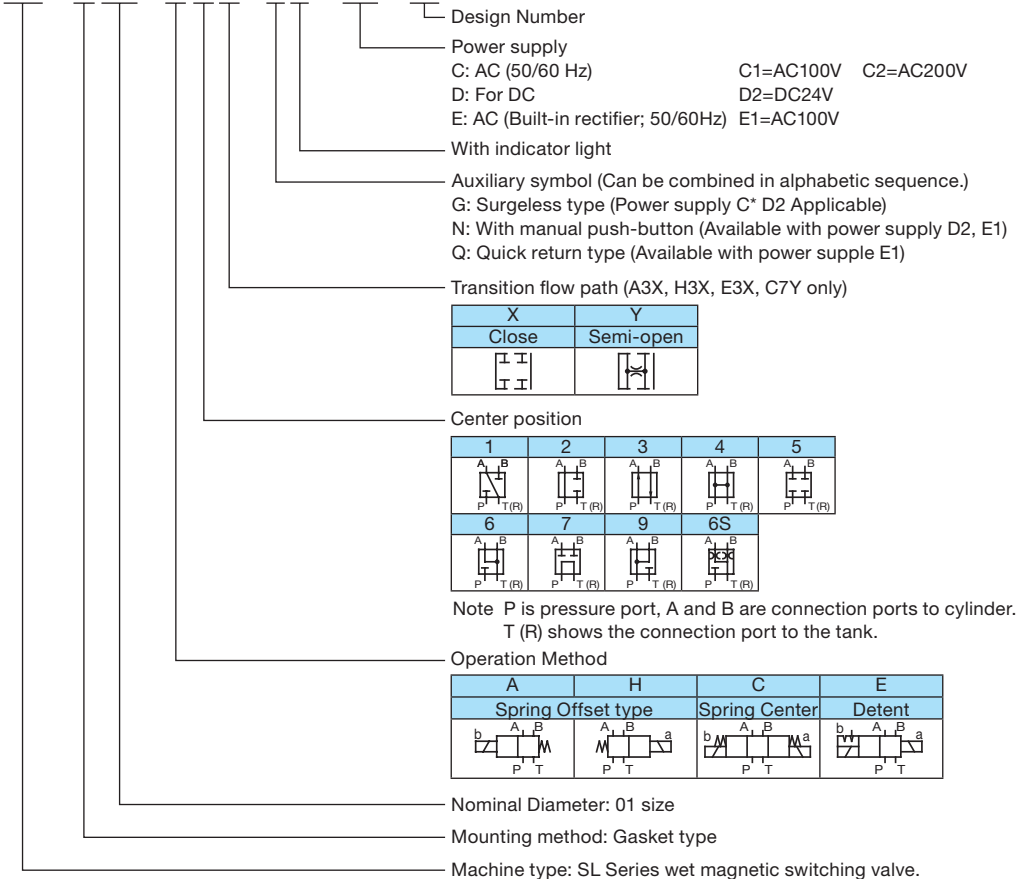
● Solenoid Assembly Specifications

Solenoid Type	AC Solenoid						DC Solenoid		
	C1			C2			Built-in Rectifier	D2	
Power Supply Type	C1			C2			E1	D2	
Voltage (V)	AC100		AC110	AC200		AC220	AC100	DC24	
Cycles (Hz)	50	60	60	50	60	60	50/60	-	
For 01	Solenoid Coil Type	EL64-C1			EL64-C2			ELC64-E1-1A	ELC64-D2-1A
	Drive Current (A)	1.30	1.10	1.30	0.65	0.55	0.65	0.11	0.42
	Holding Current (A)	0.30	0.24	0.28	0.15	0.12	0.14		
	Holding Power (W)	12.0	9.6	12.2	12.0	9.6	12.2	10	10
	Allowable Voltage Range (V)	80 to 110		90 to 120	160 to 220		180 to 240	90 to 110	21.6 to 26.4
	Allowable Pressure (MPa(kgf/cm ²))	7{71}							
Insulator Resistance (MΩ)	100 or greater (500 V)								

- Note) 1. A DC solenoid surge absorption circuit is effective in preventing misoperation in sensitive relays and IC circuits. (Applicable for power supply display D", option: G)
 2. A DC solenoid RAC type (power supply E1) greatly increases the life of the contacts by eliminating contact arc without changing circuit sequence on an AC line, 50/60Hz can be used.

Explanation of model No.

SL - G 01 - A 3 X - * R - C2 - 31



Options

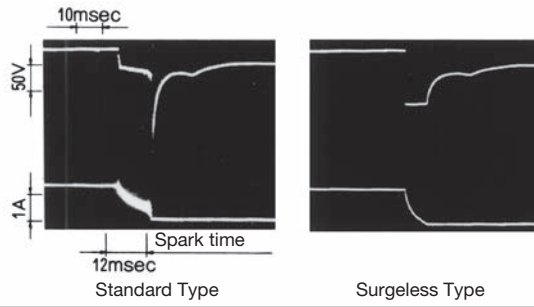
(Auxiliary Symbol)

Surgeless Type (Auxiliary Symbol: G)

The surge pressure waveforms when the DC solenoid valve power supply is opened and closed by a relay are shown at the bottom of this block.

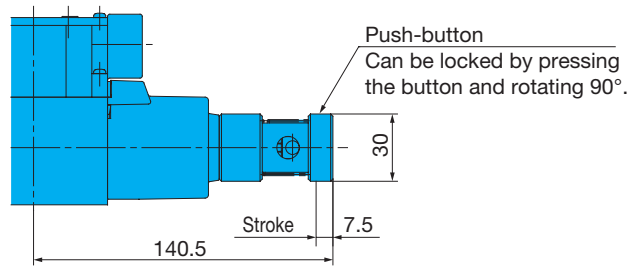
A built-in surge absorber element eliminates sparking and surge pressure.

- Features
- Surge voltage is inhibited.
 - Sparking at relay contact points is eliminated.

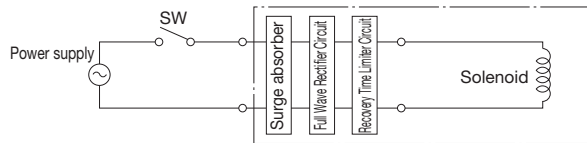


Solenoid Valve

Manual Push-button Type (Auxiliary symbol: N)



Quick Return Type (Auxiliary Symbol: Q)



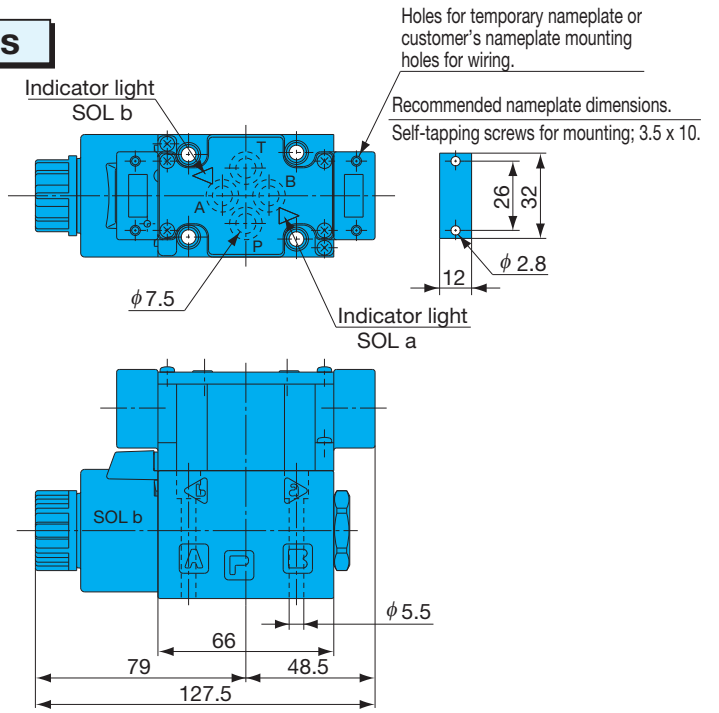
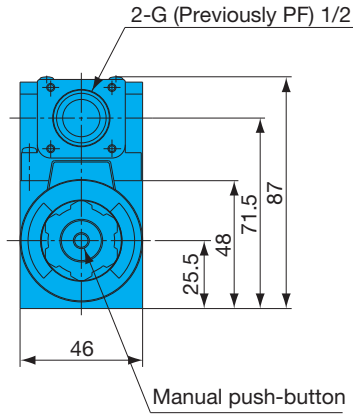
Handling

- 1 This type is used in the case of power supply type E1 (with built-in rectifier) to shorten the spring return time. This also applies to D2.
- 2 The quick return mechanism is built-in.

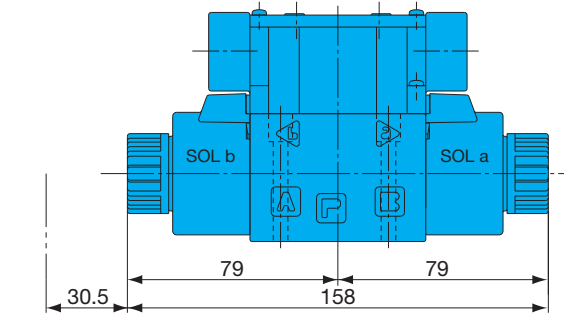
Installation Dimension Drawings

AC Solenoid
 SL-G01-A**-R-C*-31
 SL-G01-H**-R-C*-31

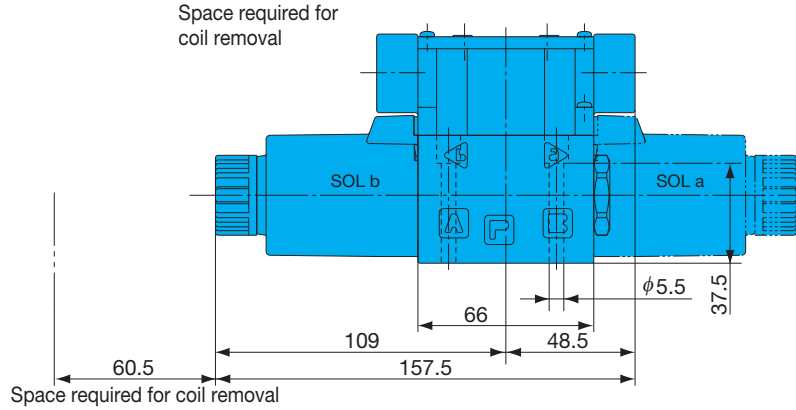
Note) The SL-G01-H**-R**-31 solenoid, is attached to the opposite side (SOL a) as shown in the diagram.



SL-G01-C**-R-C*-31
 SL-G01-E**-R-C*-31



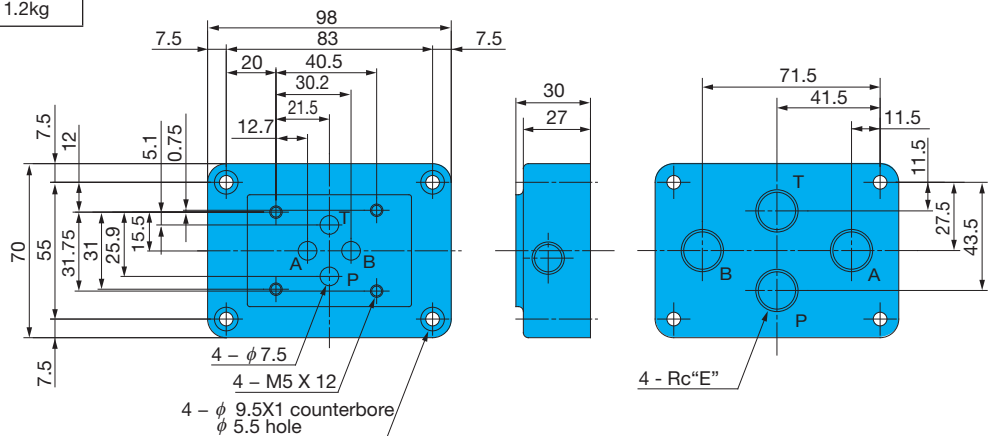
DC Solenoid and Rectifier
 SL-G01-A**-R-D/E*-31
 SL-G01-H**-R-D/E*-31
 SL-G01-C**-R-D/E*-31
 SL-G01-E**-R-D/E*-31



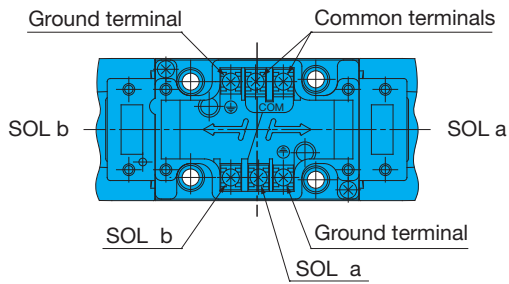
For sub plate SL-G01

Model No.	E	Weight
MSA-01X-10	1/4	1.2kg
MSA-01Y-10	3/8	1.2kg

Gasket Surface Dimensions
 (ISO 4401-03-02-0-05
 (JIS B 8355 D-03-02-0-05))



Wiring Diagram



- Note) 1. In the case of a double solenoid valve, a common terminal is provided to simplify wiring. When the common terminal is not used, remove the terminal screws.
 2. Use the ground terminal when grounding is required.
 3. Use an M3 type as a solderless terminal.
 4. Tighten terminal screws to a torque of 0.5 to 0.7N·m (5.1 to 7.1kgf·cm).

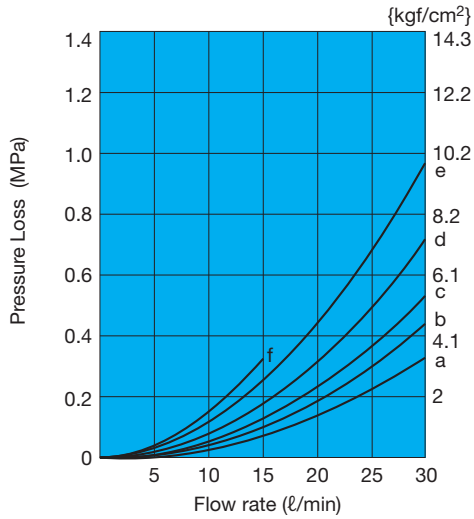
Electrical Circuit Diagram

Type	Model No.	Electrical Circuits
AC Solenoid	SL-G01-***-R-C*-31	
AC Solenoid Surgeless Type	SL-G01-***-GR-C*-31	
Built-in Rectifier	SL-G01-***-R-E*-31	
DC Solenoid	SL-G01-***-R-D*-31	
DC Solenoid Surgeless Type	SL-G01-***-GR-D*-31	
Built-in Rectifier Quick Return Type	SL-G01-***-QR-E*-31	See page E-4 for more information.

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 20 mm²/s {cSt}

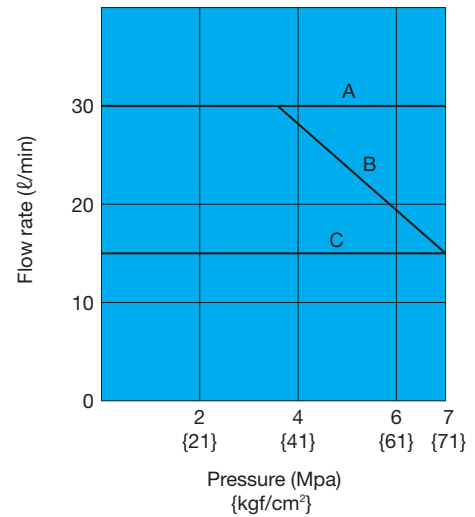
Pressure Loss Characteristics



Flow Path	P→A	P→B	A→T	B→T	P→T
A5	-	c	c	-	-
H5	c	-	-	c	-
A3X, H3X, E3X	b	b	e	e	-
C1	c	c	a	c	-
C2	a	c	e	c	-
C4	a	a	c	c	d
C5, C6S	c	c	c	c	-
C6	c	c	a	a	-
C7Y	f	f	e	e	d
C9	a	a	e	e	-

Pressure – Flow Volume Allowable Value

Operation Example / Operation Symbol	Diagram 1	Diagram 2	Diagram 3
A5	A	-	B
H5		B	-
A3X, H3X, E3X C1, C2, C4, C5 C6, C9, C6S	C	B	B
C7Y		C	C



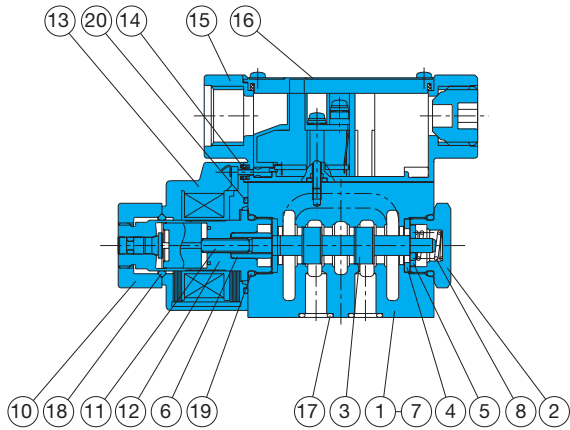
Switching Response Time

Model No.	Response Time (sec)		Measurement Conditions
	Solenoid ON	Spring Return	
SL-G01-**-R-C*-31	0.010 to 0.020	0.010 to 0.020	7MPa{71kgf/cm ² }
SL-G01-**-R-E1-31	0.055 to 0.080	0.150 to 0.185	20l/min
SL-G01-**-G)R-D2-31	0.055 to 0.080	0.025 to 0.035	40mm ² /s {cSt}

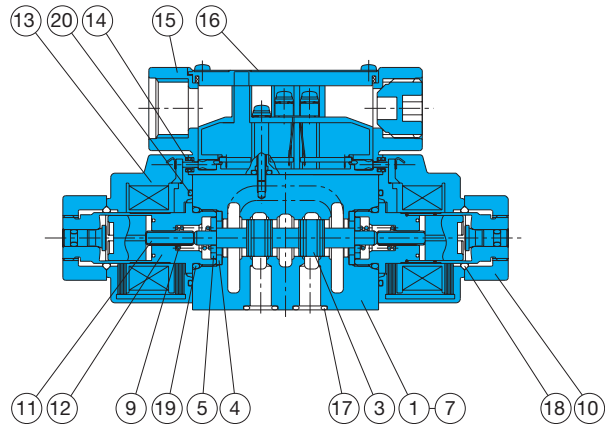
Note) 1. The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)
 2. In the case of power supply type E1 (with built-in rectifier), the spring return time using Quick Return (option symbol: Q) is the same as D2.

Cross-sectional Drawings

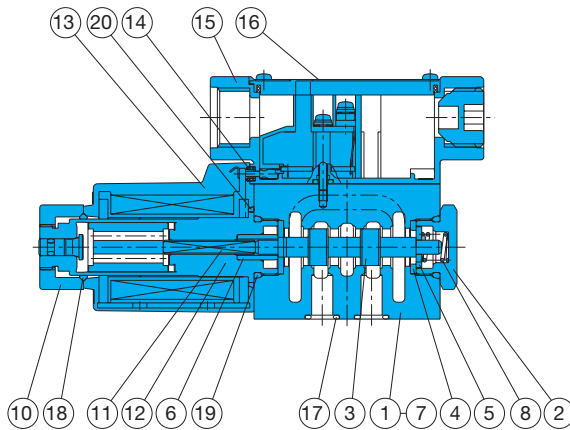
SL-G01-A**-R-C*-31



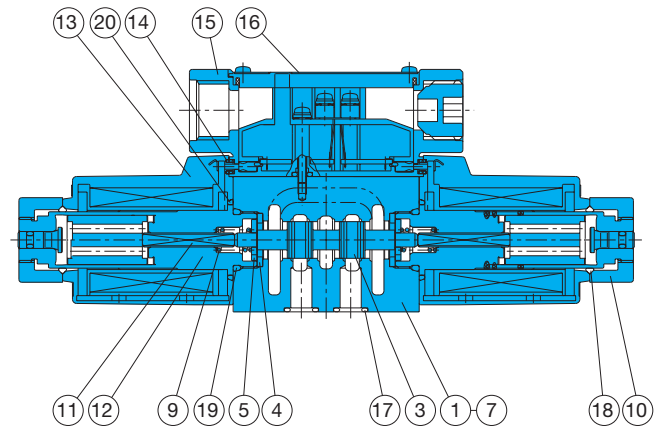
SL-G01-C**-R-C*-31



SL-G01-A**-R-D/E*-31



SL-G01-C**-R-D/E*-31



List of Sealing Parts

Part No.	Part Name	Type/ Part Number		Q'ty	
		DC SOL	AC SOL	Single Solenoid	Double Solenoid
17	O-ring	AS568-012(NBR-90)		4	4
18	O-ring	NBR-70-1 P20	NBR-70-1 P18	1	2
19	O-ring	NBR-90 P18		2	2
20	O-ring	S-25(NBR-70-1)	AS568-025(NBR-70-1)	1	2

Note) The materials and hardness of the O-ring conforms with JIS B2401. AS568 is SAE standard.

Part No.	Part Name	Part No.	Part Name
1	Body	11	Rod
2	Plug	12	Solenoid guide
3	Spool	13	Solenoid coil
4	Retainer A	14	Packing
5	Retainer B	15	Terminal box kit
6	Retainer C	16	Nameplate
7	Spacer	17	O-ring
8	Spring A	18	O-ring
9	Spring C	19	O-ring
10	Nut	20	O-ring

Seal Kit Number

AC SOL.		DC SOL.	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
ELCS-AA	ELCS-CA	ELCS-AD	ELCS-CD



DSS (DSA) 22 Design Series Solenoid Control Valve

300 to 600ℓ/min
32 to 35MPa

Features

- ① Long-life operation is ensured by use of the high-performance, renowned SS(SA)-G01 wet solenoid valve as the pilot valve.
- ② High pressure, high capacity
The 04 size can provides up to 300 ℓ/min, while the 06 size delivers up to 600 ℓ/min.
- ③ Low pressure loss
An original flow path design provides wide-ranging low pressure loss and enhanced system circuit efficiency.
- ④ Internal modification of the pilot and drain can be accomplished without removing the valve by simply connecting and disconnecting plugs.
- ⑤ Built-in pilot pressure check valve
When tandem center type valve is used for the internal pilot valve (option), pilot pressure required for switching is self-maintained.

Specifications

Valve Size		04 Size	06 Size	
Valve Model Number		DSS(DSA)-G04-***-R**-22	DSS(DSA)-G06-***-R**-22	
Maximum Working Pressure MPa{kgf/cm ² }	P.A.B. Ports	35{357}	32{326}	
	T Port	Internal Drain Type	16{163}	
		External Drain Type	21{214}	
Maximum Flow Rate ℓ/min		300	600	
Rated Flow Rate ℓ/min		150	300	
Maximum Pilot Pressure MPa{kgf/cm ² }		25{255}	25{255}	
Minimum pilot pressure MPa{kgf/cm ² }	A** (Spring Offset Type)	0.8{8.2}	0.8{8.2}	
	E** (No-spring Detent Type)			
	C** (Spring Center Type)	1.2{12.2}	1.2{12.2}	
	D** (Pressure Center Type)			
	Built-in Pilot Pressure Check Valve Type (For Internal Pilot)		0.45 {4.6} (for *3Z, *4, *7*, *8 pilot pressure generation)	
Maximum Changeover Frequency (cycles/minute)		120	120	
Pilot Volume (cm ³)	A** (Spring Offset Type)	8.0	20.0	
	C** (Spring Center Type)	4.0	10.0	
Weight (kg)	A** (Spring Offset Type)	8.7(9.5)	14.5(15.4)	
	E** (No-spring Detent Type)	9.2(10.0)	15.0(15.9)	
	C** (Spring Center Type)			
	D** (Pressure Center Type)	10.5	16.5	
Operating Environment	Dust-resistance/Water-resistance Rank JIS C 0920		DSS: IP64 (Dust-tight, Splash-proof) DSA: IP65 (Dust-tight, Waterjet-proof)	
	Ambient Temperature		-20 to 50°C	
	Operating Fluid	Temperature Range		-20 to 70°C
		Kinematic Viscosity Range		15 to 300mm ² /s
		Filtration		25 μm or less
Bundled Accessories	Mounting bolt		M6 × 45 (Two) M10 × 50 (Four)	
	Tightening Torque N·m{kgf·cm}		M6 10 to 13{102 to 133} M10 45 to 55{460 to 560}	

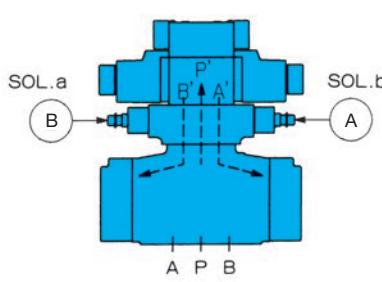
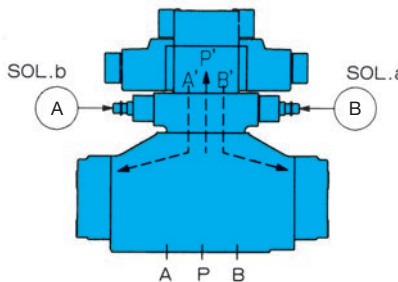
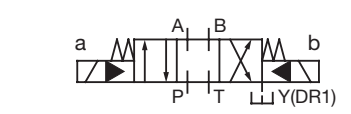
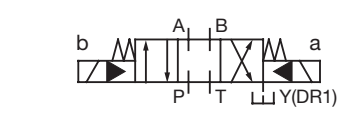
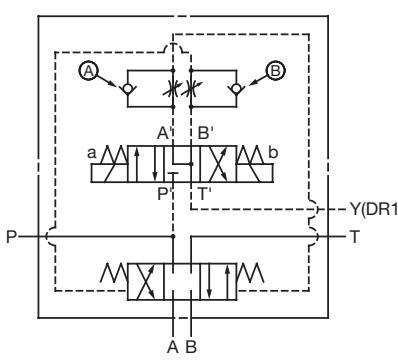
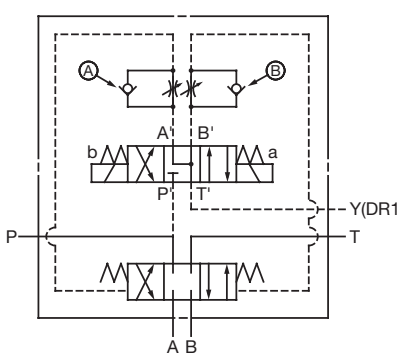
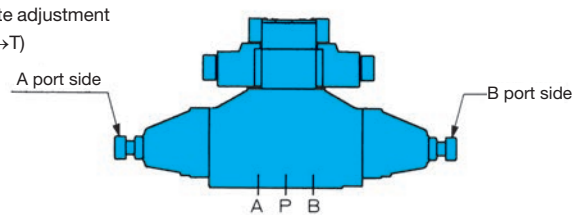
- Note) 1. The maximum flow rate of each valve depends on the pressure. For details, see pages E-50 and E-51.
 2. Weight in parentheses is for stroke adjustment type.
 3. Solenoid specifications are the same as those for SS (SA)-G01. For more information, see pages E-3 and E-15.
 4. For mounting bolts, use bolts of 12.9 strength classification or equivalent.

● Handling

- 1 Pilot pressure values show the differential pressure between the pilot port and tank port or drain port. In the case of the pressure center, they show differential pressure between the pilot and drain ports (DR1, DR2).
- 2 The standard configuration is internal pilot and external drain, but other configurations are possible when required. See page E-52 for more information.
- 3 The JIS number on the nameplate indicates the standard internal pilot and external drain. Note therefore that the JIS numbers on page E-50 and E-51 are used

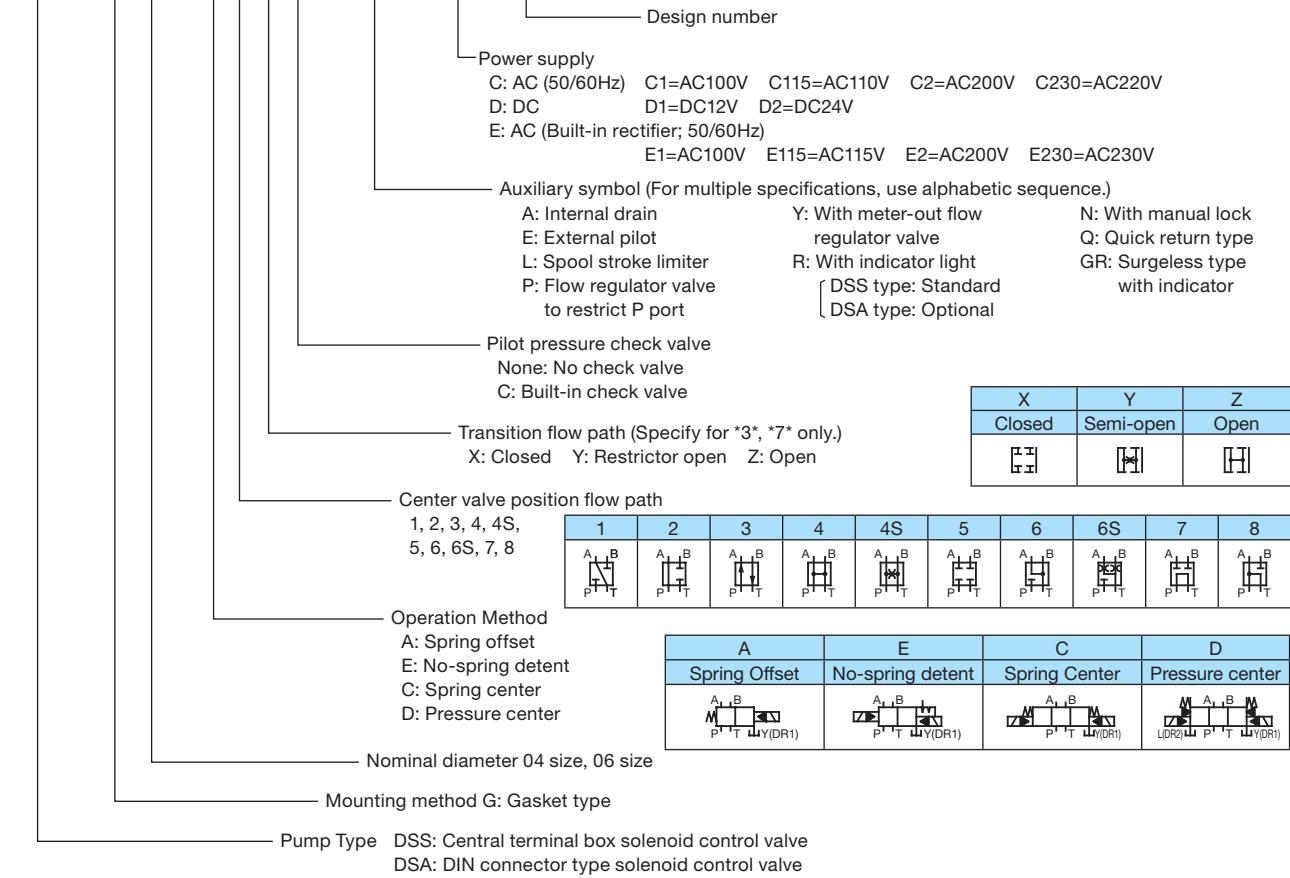
- 4 The maximum operating pressure for internal pilot is 25MPa because it is limited by the pilot pressure.
- 5 For the PT mounting type DSS(DSA)-G**-C7*--22, open cross over with restrictor C7Y is standard.
- 6 When adjustable spool stroke is desired, specify L in the auxiliary symbol position of the model number. Note, however, that this is not available with the pressure center type.
- 7 When using a detent type (E3*), use constant energization in order to securely maintain the switching position.

- 8 Use of the pressure center type is recommended for large-volume flow control.
- 9 For the all ports open center type (A3Z, E3Z, C4, D4), PT mounting type (C7X, C7Y, D7X, D7Y), and PAT mounting type, use the type with built-in external pilot pressure check valve.
- 10 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

Valve Model Number	DSS(DSA)-G04	DSS(DSA)-G06
Front Position		
	The pilot solenoid valve on the 04 size and the 06 size are mounted in opposite directions. Refer to the middle of the next page for models of the pilot solenoid valve that are mounted.	
Simplified Symbols		
Detailed Symbols		
Flow Regulator Adjusting Screw Positions	A Port Restrictor: Right side A B Port Restrictor: Left side B	A Port Restrictor: Left side A B Port Restrictor: Right side B
Adjustable Stroke Adjusting Screw Positions	<p>A Port Side: P→A, B→T flow rate adjustment (For C7Y, P→B, A→T)</p> <p>B Port Side: P→B, A→T flow rate adjustment (For C7Y, P→A, B→T)</p> 	

Explanation of model No.

DSS - G 06 - C 7 Y C - **R* - C2 - 22



Pilot (PP), Drain (DR)

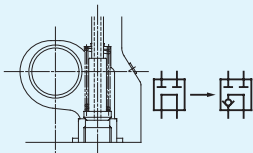
*High Pilot Pressure
 Use at pressures that do not exceed 25MPa[255kgf/cm²]
 *Internal PP, external DR are Nachi-Fujikoshi standards.
 For external PP: Built-in stopper plug (Option E)
 For internal DR: Stopper plug modification (Option A)
 *Internal DR Precautions
 Make sure that the differential pressure between the pilot pressure and tank back pressure is greater than the minimum pilot pressure.
 Do not connect any pipe that generates sudden surge pressure.

Built-in Pilot Solenoid Valve

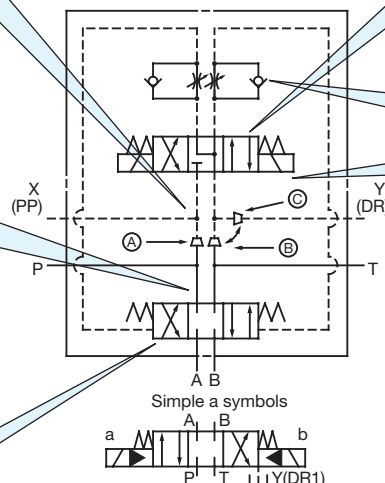
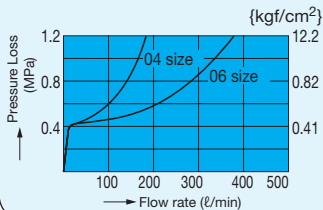
Valve Model Number	For G04	For G06
DSS(DSA)-G**-A**	SS(SA)-G01-A3X	SS(SA)-G01-H3X
DSS(DSA)-G**-E**	SS(SA)-G01-E3X	
DSS(DSA)-G**-C**	SS(SA)-G01-C6	
DSS(DSA)-G**-D**	SS(SA)-G01-C9	

Built-in Pilot Pressure Check Valve

*Like the C7Y, this internal PP type is used in a flow path configuration where maintenance of pilot pressure is required.



Check Valve Pressure Loss



Note) Above symbols are for DSS (DSA)-G06.

Flow Regulator Valve

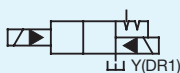
*Rotating the adjusting screw clockwise (rightward) slows the main spool switching speed.
 P: Excitation of the solenoid (starting of the actuator) causes a restrictor effect.
 Y: The restrictor effect can be obtained especially when the solenoid is de-excited (actuator stopped).

Pilot Valve Mounting Bolts

Standard	M5x45 (four)
Stage 1	M5x85 (four)
Stage 2	M5x125 (four)
Stage 3	M5x165 (four)

(Tightening Torque: 5 to 7N·m [51 to 71kgf-cm])

Detent Type Installation



*Install the valve in a horizontal configuration.
 *Provide constant energization for secure holding.

Adjustable Stroke Type

*Tightening the adjusting screw makes the main spool stroke smaller, which restricts flow.

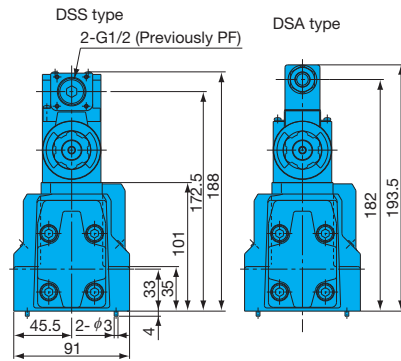
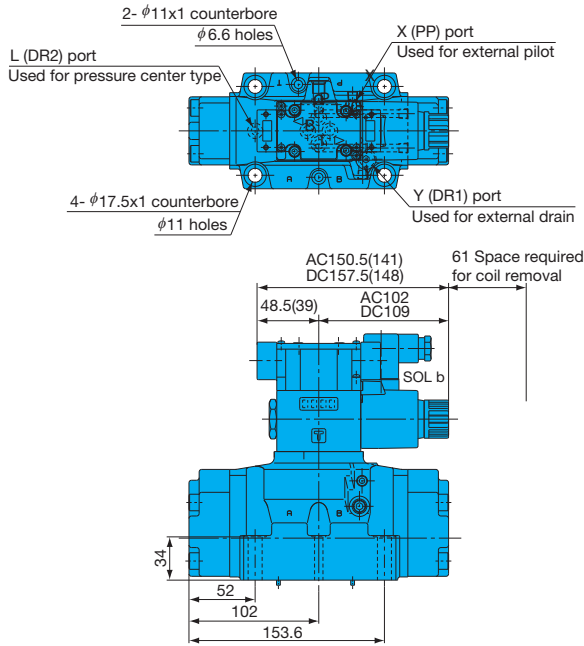
Pressure center

*Use this valve in a high-pressure, large-volume circuit to ensure reliable return of the main spool to the neutral position.

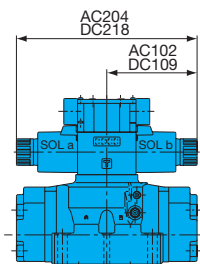
Sub Plate Number

Size	Model No.	Connecting Pipe Diameter	Weight (kgf)
For G04	MDS-04-10	Rc 1/2	4.5
	MDS-04X-10	Rc 3/4	
For G06	MDS-06-30	Rc 3/4	5.2
	MDS-06X-30	Rc1	

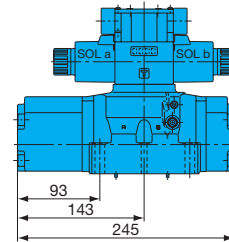
DSS(DSA)-G04-A**-R**-22
(Spring Offset Type)



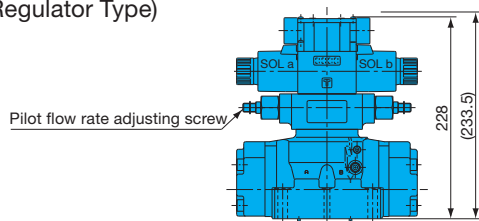
DSS(DSA)-G04-^E/_C** -R**-22
(No-spring Detent Type)
(Spring Center Type)



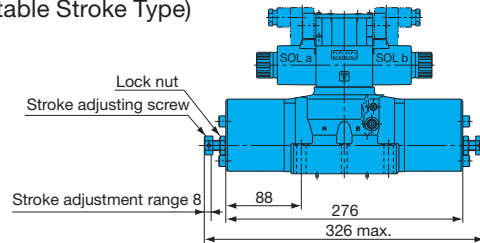
DSS(DSA)-G04-D**-R**-22
(Pressure Center Type)



DSS(DSA)-G04-^A/_C** -R^E-Y**-22
D
(Flow Regulator Type)



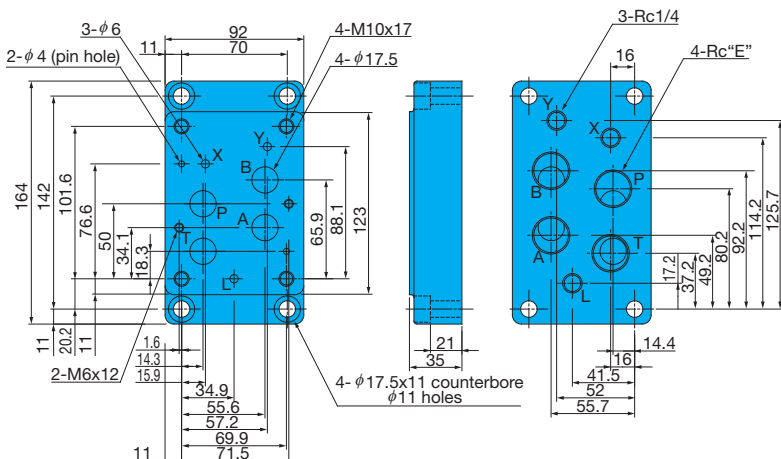
DSS(DSA)-G04-^A/_C** -LR**-22
(Adjustable Stroke Type)



Dimensions in the parentheses are for the DSA-G04-***-R^E-Y**-22.

Gasket Surface Dimensions

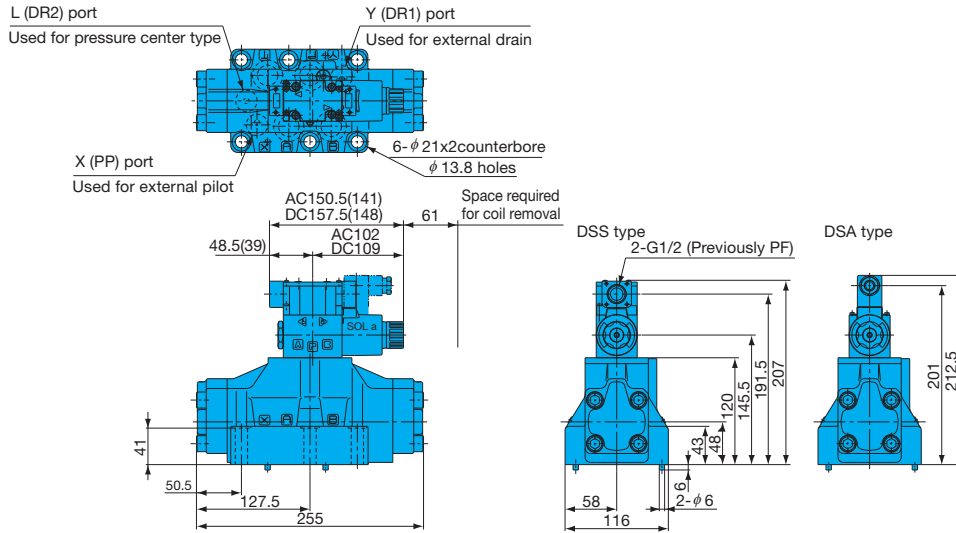
(ISO 4401-07-06-0-05
JIS B 8355 D-07-06-0-05)



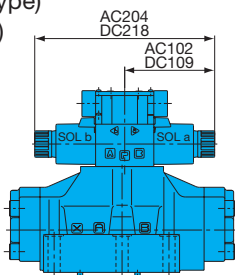
For sub plate DSS (DSA) -G04

Model No.	E	Weight
MDS-04-10	1/2	4.5kg
MDS-04X-10	3/4	

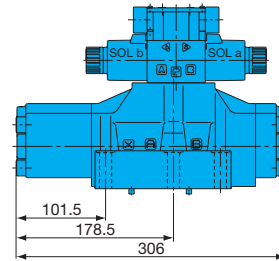
DSS(DSA)-G06-A**-R**-22
(Spring Offset Type)



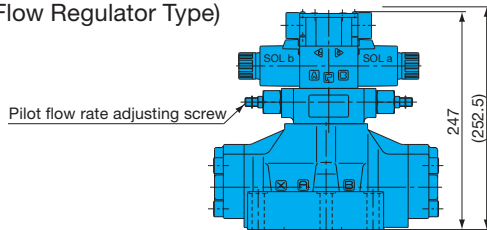
DSS(DSA)-G06-E**-R**-22
C
(No-spring Detent Type)
(Spring Center Type)



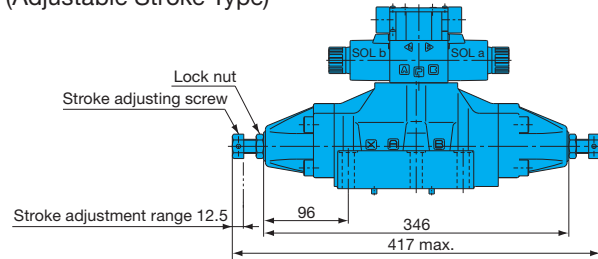
DSS(DSA)-G06-D**-R**-22
(Pressure Center Type)



DSS(DSA)-G06-E**-RY**-22
A
C
D
(Flow Regulator Type)



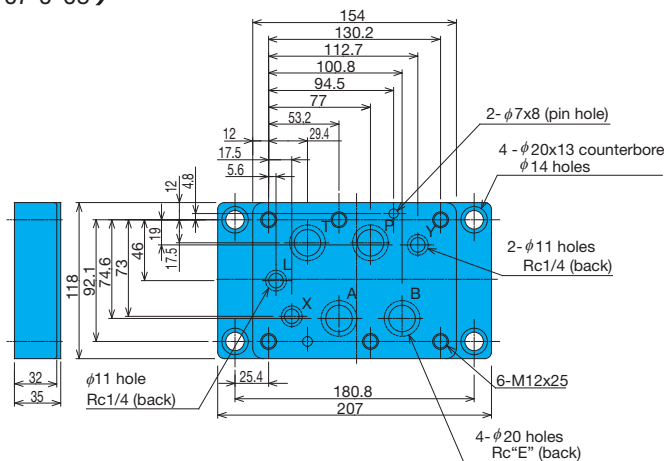
DSS(DSA)-G06-E**-LR**-22
A
C
(Adjustable Stroke Type)



Dimensions in the parentheses are for the DSA-G06-***-RY**-21.

Gasket Surface Dimensions

(ISO 4401-08-07-0-05
JIS B 8355 D-08-07-0-05)



For sub plate DSS (DSA) -G06

Model No.	E	Weight
MDS-06-30	3/4	5.2kg
MDS-06X-30	1	

Performance Curves

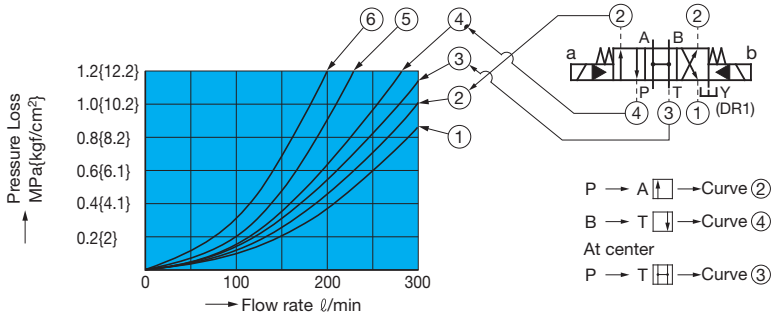
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

DSS(DSA)-G04

Model No.	JIS Symbol	Pressure - Flow Rate Allowable Value	Model No.	JIS Symbol	Pressure - Flow Rate Allowable Value
2-Position Spring Offset Type	DSS(DSA) -G04 -A3X-		2-Position No-spring Detent Type	DSS(DSA) -G04 -E3X-	
	-A3Z-			-E3Z-	
	-A3Y-			-E3Y-	
3-Position Spring Center Type	DSS(DSA) -G04 -C1-	<p>PP-0.8MPa{8.2kgf/cm²}</p> <p>PP-1.2MPa{12.2kgf/cm²}</p>	3-Position Pressure Center Type	DSS(DSA) -G04 -D1-	
	-C2-			-D2-	
	-C5-	-D5-			
	-C6-	-D6-			
	-C6S-	-D6S-			
	-C4S-	-D4S-			
	-C4-	-D4-			
	-C8-	-D8-			
	-C7X- -C7Y-	-D7X- -D7Y-			

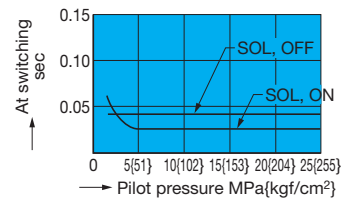
Note) The JIS number indicates the standard internal pilot and external drain.

Pressure Loss Characteristics



Switching Response Time

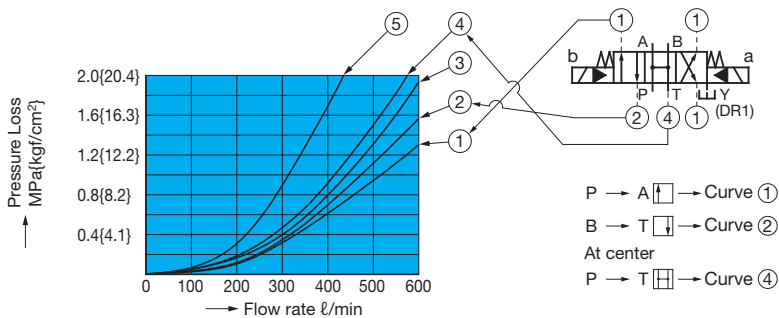
Model No. : DSS-G04-C5
 Voltage Symbol: C1 (AC Solenoid)



Model No.		JIS Symbol	Pressure - Flow Rate Allowable Value	Model No.		JIS Symbol	Pressure - Flow Rate Allowable Value
2-Position Spring Offset Type	DSS(DSA) -G06 -A3X-			2-Position No-spring Detent Type	DSS(DSA) -G06 -E3X-		
	-A3Z-				-E3Z-		
	-A3Y-				-E3Y-		
3-Position Spring Center Type	DSS(DSA) -G06 -C1-			3-Position Pressure Center Type	DSS(DSA) -G06 -D1-		
	-C2-				-D2-		
	-C5-				-D5-		
	-C6-				-D6-		
	-C6S-				-D6S-		
	-C4S-				-D4S-		
	-C4-				-D4-		
	-C8-				-D8-		
	-C7X- -C7Y-				-D7X- -D7Y-		

Note) The JIS number indicates the standard internal pilot and external drain.

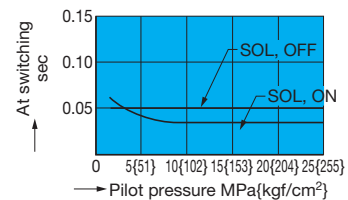
Pressure Loss Characteristics



Note) Interpreting the Pressure Loss Value

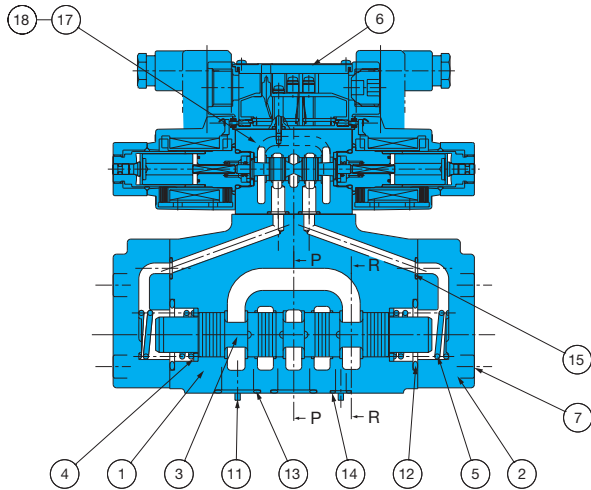
Switching Response Time

Model No. : DSS-G06-C5
Voltage Symbol: C1 (AC Solenoid)

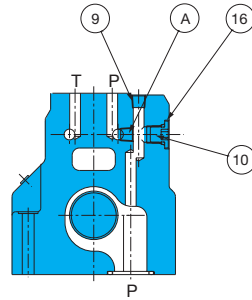


Cross-sectional Drawings

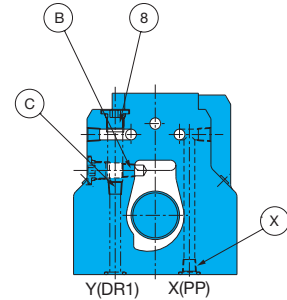
DSS(DSA)-G04-C**-R-C*-22



Pilot, Drain System Change

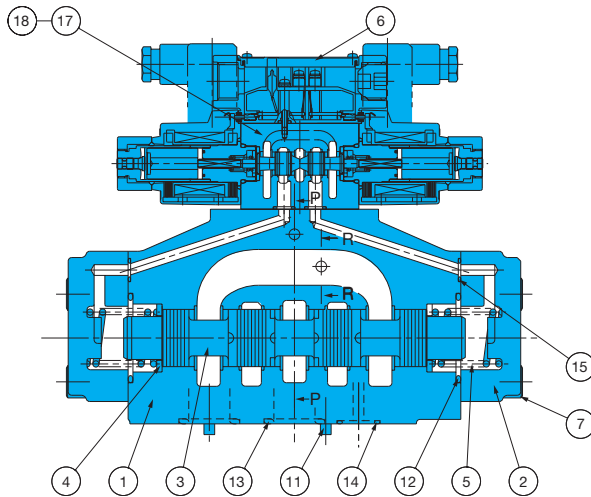


Cross-sectional P-P

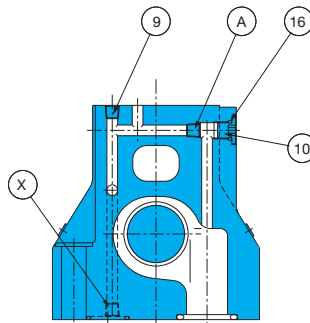


Cross-sectional R-R

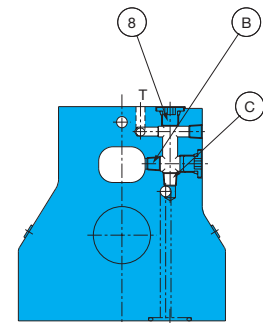
DSS(DSA)-G06-C**-R-C*-22



Pilot, Drain System Change



Cross-sectional P-P



Cross-sectional R-R

Changing the Pilot and Drain Connections

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	8	Plug	14	O-ring
2	Cover	9	Plug	15	O-ring
3	Spool	10	Plug	16	O-ring
4	Ring	11	Pin	17	Solenoid Valves
5	Spring	12	O-ring	18	Screw
6	Nameplate	13	O-ring		
7	Screw				

		After Change	Hexagon Socket Head Plug
Pilot	Internal		Switch from (A) to (X).
	External		Switch from (X) to (A).
Drain	Internal		Switch from (B) to (C).
	External		Switch from (C) to (B).

List of Sealing Parts

Part No.	Part Name	Part Number		Q'ty
		04 size	06 Size	
12	O-ring	NBR-90 P34	NBR-90 G45	2
13	O-ring	NBR-90 P22	NBR-90 P28	4
14	O-ring	NBR-90 P10A	NBR-90 P20	2
15	O-ring	NBR-90 P9	NBR-90 P10	2
16	O-ring	NBR-90 P8	NBR-90 P8	3

Seal Kit Number

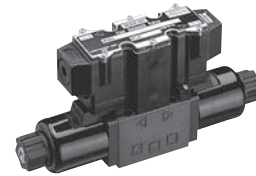
04 size		06 Size	
Single Solenoid	Double Solenoid	Single Solenoid	Double Solenoid
EDBS-04AA-1A	EDBS-04CA-1A	EDBS-06AA-1A	EDBS-06CA-1A

Note) The seal kit includes a seal for the pilot solenoid valve.

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. See SS/SA-G01-**-31 for information about the seal part for the pilot solenoid valve.

Fine Solenoid Valve SF Series

10 to 40ℓ/min
21MPa



Features

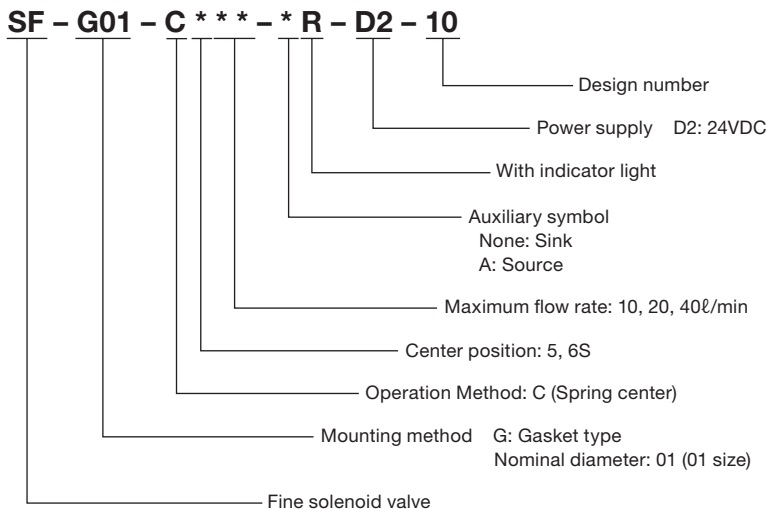
- ① The function of two valves in one
A two-speed controller provides smooth speed adjustment from low speed to high, and from high-speed to low.
- ② Quiet starts and stops
A low-speed startup and stop feature makes startups and stops smooth and soft.
- ③ Separate control of forward and back cylinder movement
There are five volume settings for highspeed flow rate and acceleration/deceleration times that can be independently adjusted SOL.a and SOL.b (ON side, OFF side).

Specifications

Item	Model No.	SF-G01 -C*10-D2-10	SF-G01 -C*20-D2-10	SF-G01 -C*40-D2-10
Valve Maximum Operating Pressure MPa(kgf/cm ²)		21{214}		
Maximum Flow Rate ℓ/min(Note1)		10	20	40
High-speed Flow Rate ℓ/min(Note1)		5 to 10	10 to 20	20 to 40
Low-speed Flow Rate ℓ/min(Note1)		0.5 to 4	2 to 8	4 to 16
Maximum Allowable Pressure MPa(kgf/cm ²)		7{71}		
Acceleration/Deceleration Time Adjustment Range SEC		0.1 to 2		
Hysteresis (Note 2)		7%		
Repeatability (Note 2)		3%		
Power Supply Voltage V		D2: 24V DC regulated DC power supply		
Maximum Power Consumption W		36W		
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP63(Dust-tight, Rain-proof)		
	Ambient Temperature	5 to 50°C		
	Operating Fluid	Temperature Range	5 to 60°C	
		Kinematic Viscosity Range	15 to 300mm ² /s	
Mounting	Size x Length	M5x45 (four)		
		Tightening Torque	5 to 7N·m{51 to 71kgf·cm}	

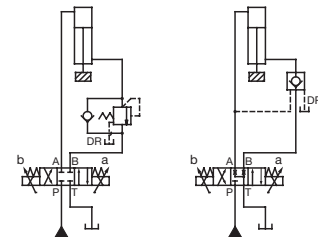
- Note) 1. The above high-speed and low-speed flow rates are obtained with a differential pressure (PA, PB) of 1.0MPa {10.2kgf/cm²}. The flow rates depend on differential pressure.
2. Hysteresis and repeatability values are those at maximum flow rate.
3. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
4. Mounting bolts are not included.

Explanation of model No.



● Handling

- ① Valve differential pressure
Volume adjustment becomes sensitive when P→A (B) and B(A)→T differential pressure is large. Maintain the pressure differential so it is no greater than 3.5MPa {35.7kgf/cm²}.
- ② Low-speed flow rate
The spool may not move if the low-speed flow rate is below the minimum. Use this valve only within the allowable minimum low-speed flow rate range.
- ③ Deceleration circuit
• Use a C5** spool for the deceleration circuit. Deceleration is difficult with the C6S** spool.
• When large deceleration is required or for a system that uses a vertical cylinder, equip an external drain type counter balance valve. See the illustration below.
- ④ Pilot check circuit
• For a circuit with a pilot check valve, knocking may occur in the pilot check valve due to large load inertia and circuit pressure loss. In cases like this, use an external drain type pilot check valve. See the illustration below.



When large brake pressure is required
(Use an external drain type counter valve.)

When there is the possibility of pilot check valve knocking
(Use an external drain type pilot check valve.)

⑤ Environmental conditions

- The IC circuit board is located inside the central control box, so care must be exercised concerning water-resistance and ambient temperature.
- Water: Cover the box so there is no direct splashing with water.
- Ambient Temperature: Use in an area where the temperature is 5°C to 50°C.

⑥ Operating Fluid

- Always keep the operating fluid clean. Allowable contamination is class NAS11 or less.
 - Use oil-based hydraulic operating fluid.
 - Contact your agent when you want to use fire-resistant hydraulic fluid.
- (Continued on following page)



7 Note the following points to optimize operation.

- (1) Control oil temperature when using this valve. Since the valve perform restrictor valve control on all processes, temperature differential changes flow volume and acceleration/deceleration time. The recommended temperature range is 30°C to 60°C.
- (2) During the positioning operation following deceleration, make sure

that sufficient low-speed running is provided following deceleration before stopping operation. If low-speed operation time is too short

can cause stopping during deceleration and shock problems due to fluctuation in load, etc.

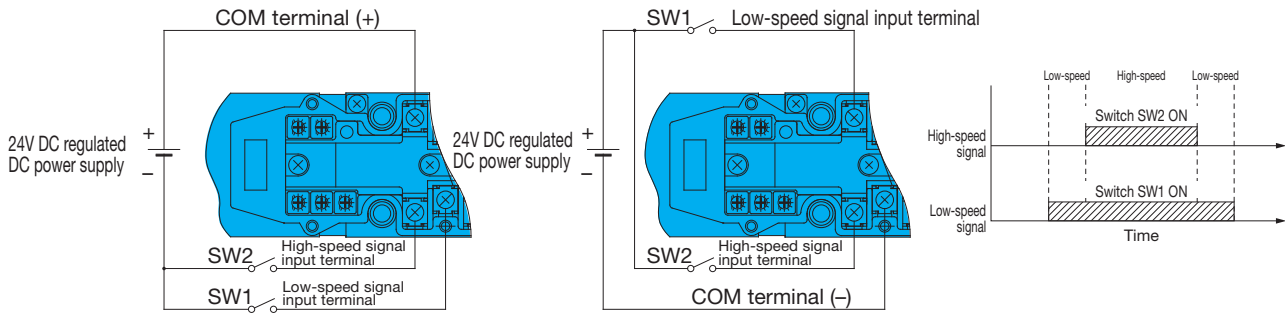
Spool Type and JIS Symbols

Spool Type	C5**	C6S**
JIS Symbol		

Electrical Wiring

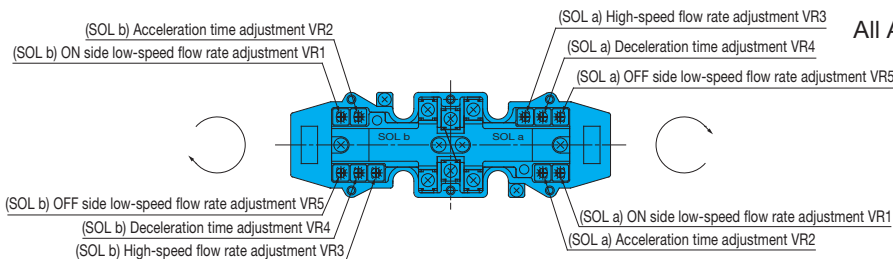
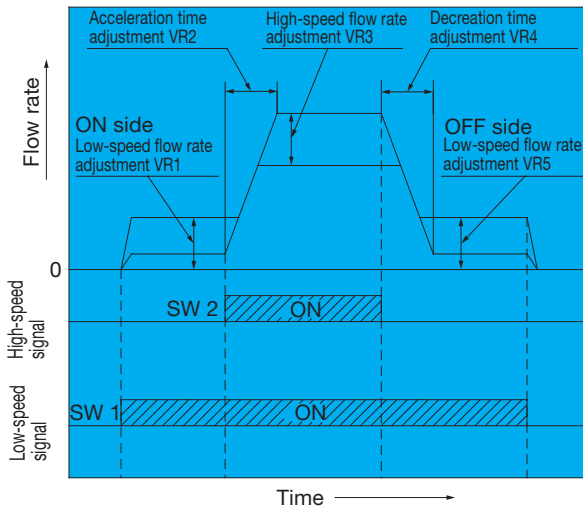
● Sink Type (Auxiliary Symbol: None)
Switches on load and power supply minus side

● Source Type (Auxiliary Symbol: A)
Switches on load and power supply plus side



Adjustment Elements

Control Pattern



Electrical Control Precautions

- Do not introduce a high-speed signal prior to a low-speed signal. Make sure the two signals are introduced simultaneously or that the low-speed signal is introduced first.
- (1) Repeatedly introducing the high-speed signal first in a source type configuration can damage the IC board.
- (2) The valve will not operate on the high-speed signal only.
- The following adjustments in the range of VR1 through VR5 can be made independently for SOL.a and SOL.b. You can make adjustments for the best conditions for forward and back operations when considering the cylinder operations.
- Adjustment volume is arranged in from VR1 through VR5 in clockwise (rightward) rotation sequence when viewed from the coil side.
- The following are the factory default volume settings.

VR1·2·4·5

— Minimum setting

VR3—Maximum setting

All Adjustment VRs

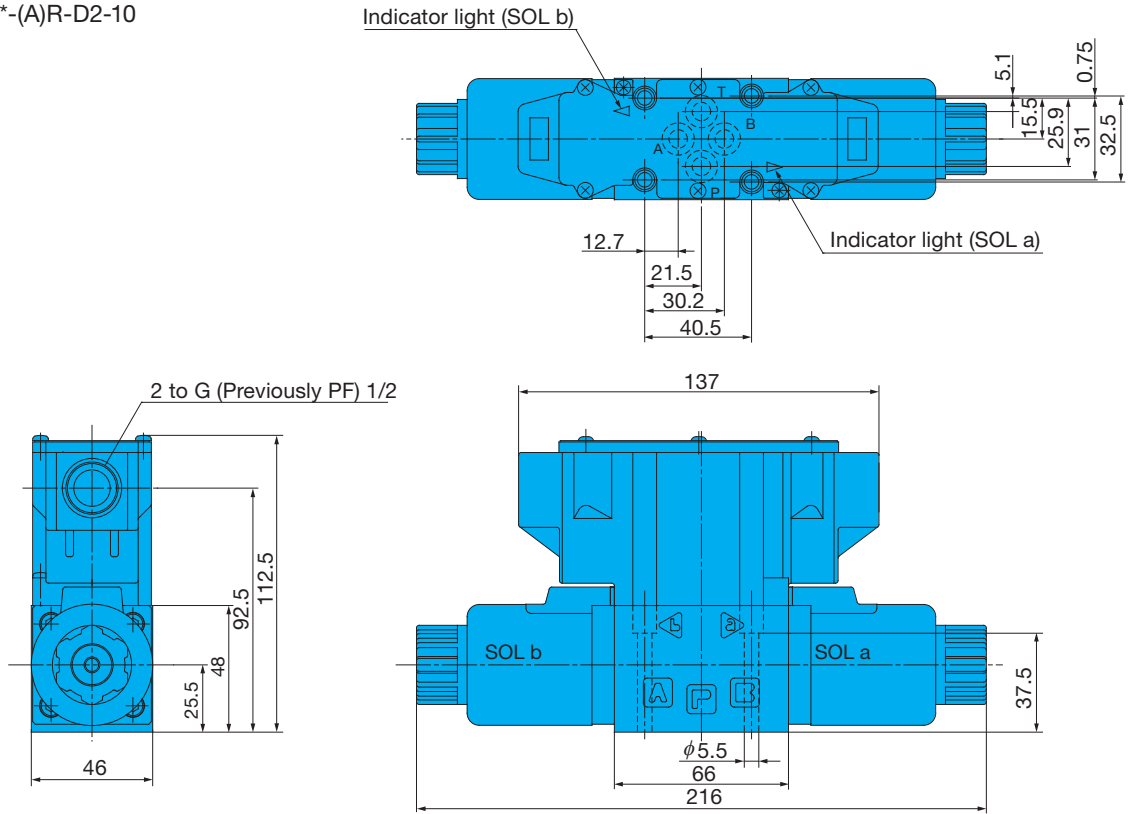


Maximum is clockwise (rightward) rotation.

- The volume rotation angle is 270°. Contact your agent about a three-rotation type adjuster for fine adjustment.

Installation Dimension Drawings

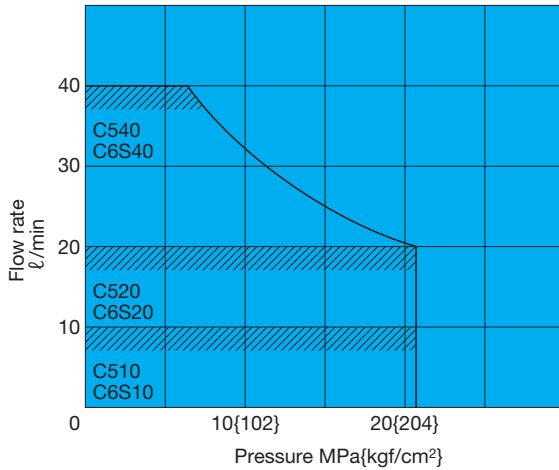
SF-G01-C***-(A)R-D2-10



Performance Curves

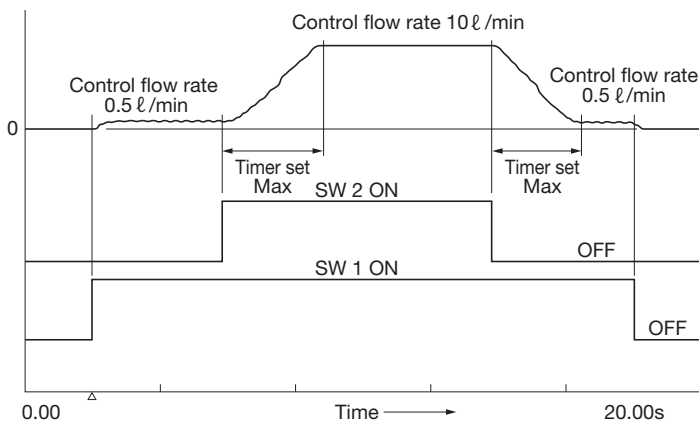
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

● Pressure – Flow Rate Characteristics

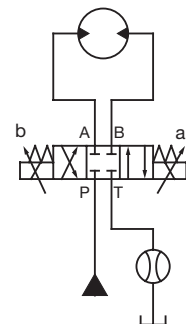


- Use the valve within the allowable flow rate range shown by the graph to the Left.
- There are no operational problems within the allowable flow rate range, even when one-pass is used.

● Control Waveform Example

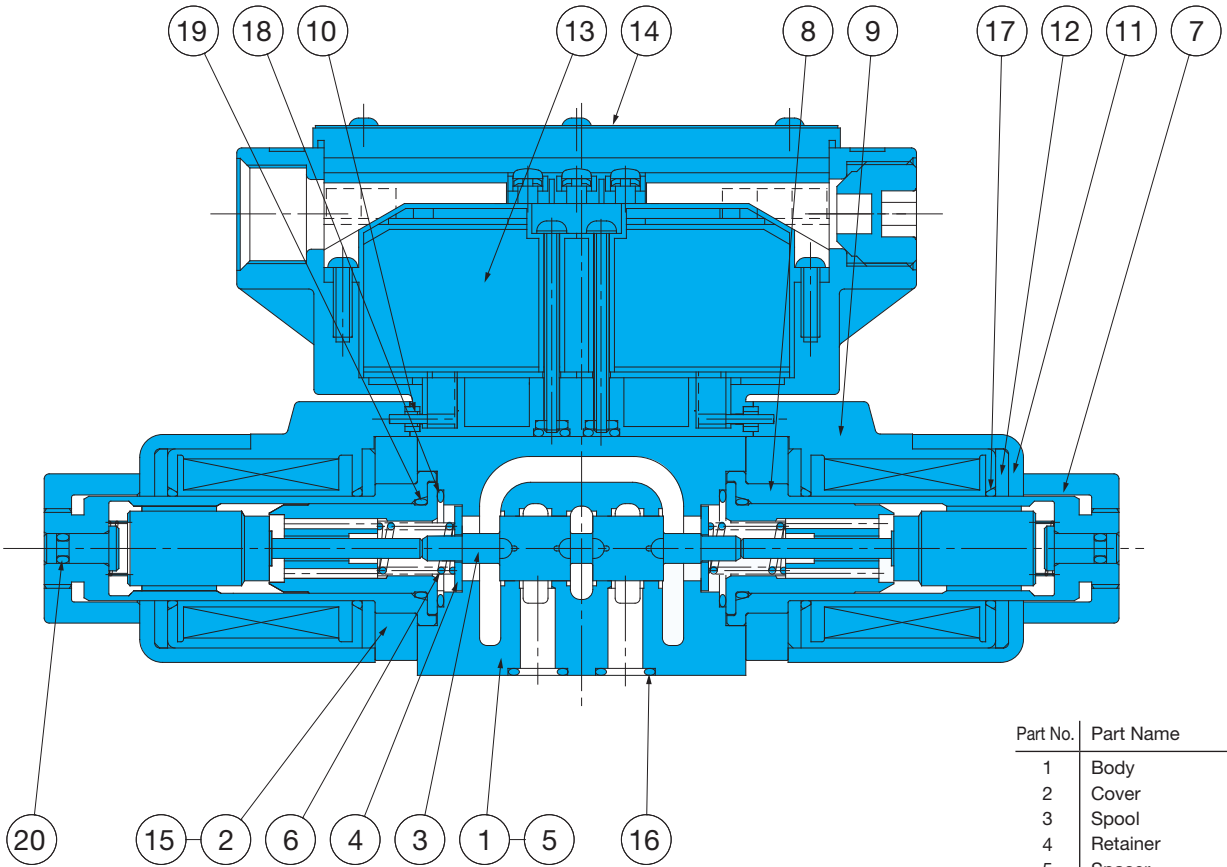


- Valve: SF-G01-C510-R-D2-10
- Supply Pressure: 21MPa{214kgf/cm²}
- Hydraulic Circuit



Cross-sectional Drawing

SF-G01-C***-(A)R-D2-10



Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Retainer
5	Spacer
6	Spring
7	Nut
8	Solenoid guide
9	Solenoid coil
10	Packing B
11	Coil case
12	Coil yoke
13	Central terminal box kit
14	Nameplate
15	Hexagon Socket Head Bolt
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	O-ring

Seal Part List (Kit Model Number EFS)

Part No.	Part Name	Type/Part Number	Q'ty
16	O-ring	AS568-012(NBR-90)	4
17	O-ring	AS568-019(NBR-70-1)	4
18	O-ring	AS568-019(NBR-90)	2
19	O-ring	AS568-017(NBR-90)	2
20	O-ring	P3 Note2	2

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.

2. Special flurorubber is used (Part Number: RO-P3-VS).

SNH Series Non-leak Type Solenoid Valve

20 to 100ℓ/min
35MPa



Features

① Virtually no internal leakage

A poppet structure minimizes internal leaks from low pressures to as high as 35MPa {357kgf/cm²}. Enhanced hydraulic circuit efficiency reduces energy needs.

② Virtually no pressure loss at high volumes

An original fluid reaction force suppression mechanism is provided for all sizes. Though compact, this valve provides the highest level switching capacity for its class.

③ High reliability

Since a wet type solenoid valve is used, the movable iron core remains immersed in oil as it moves, which minimizes switching noise and ensures reliable operation.

A wet type valve also provides superior water resistance and longer life than a dry type valve.

④ ISO standard mounting service (01, 03 sizes)

This valve can be ganged together with a modular valve, enabling simple configuration of circuits and an overall

compact device configuration.

⑤ EC connector for improved switching (06 size)

During switching, twice the current (starting current) flows to the coil than normal (holding current), which ensures reliable switching operations. The 06 size has compact configuration made possible by an original design that uses a small coil that provides high output, without the need for a large coil.

Specifications

Model No.		SNH-G01	SNH-G03	SNH-G04	SNH-G06	
JIS Symbol	AR					
	HQ					
	A2K					
Maximum Working Pressure MPa{kgf/cm ² } (P, A, B Ports)		35{357}				
Rated Flow Rate - Maximum Flow Rate ℓ/min		AR,HQ;10-20 A2K; 5-20	20-40	40-60	60-100	
Maximum Changeover Frequency (per minute)		120				
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP65(Dust-tight, Waterjet-proof) (Note 2)			IP64 (Dust-tight, Splash-proof)	
	Ambient Temperature	-20 to 50°C				
	Operating Fluid	Temperature Range	-20 to 70°C			
		Kinematic Viscosity Range	15 to 300mm ² /s			
	Filtration	25 μm or less				
Weight AR-HQ(A2K)kg		1.8(2.2)	5.2	5.5	6.9	
Mounting bolt	Size x Length	M5x45 (Four)	M8x70 (Four)	M8x70 (Four)	M10x75 (Four)	
	Tightening Torque N·m{kgf·cm}	6 to 8 {61 to 81}	30 to 35 {306 to 357}	30 to 35 {306 to 357}	55 to 60 {561 to 612}	

- Note 1. Internal leaking does not exceed 1 droplet/minute (0.05cm³/min).
 2. The power supply type for E* is IP64 (dust-tight, splash-proof).
 3. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
 4. Mounting bolts are not included with the 01 size. Bolts are included with the 03, 04, 06 sizes.

● Handling

- Take care so the B port is not subjected to abnormal surge pressure that is in excess of the maximum operating pressure.
- The manual switching (options M, N) push pin receives B port pressure, so it cannot be pushed with pressure in excess of about 5 MPa {51 kgf/cm²}. Also, note that with the HQ and A2K types, even if the manual switching push button (option N) is locked, leaks are not completely stopped.
- Use this valve only within the allowable voltage range.
- Use of water- or glycol-based hydraulic operating fluid is standard. Contact your agent about using other fire-resistant hydraulic fluid.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the B port.
- The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
- Never try to take this valve apart. The cap seal cannot be reassembled without using special tools.

● Solenoid Assembly Specifications (SNH-G01)

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SNH-G01				For SNH-G03			
				Solenoid Coil Type	Current (A)	Power (W)	Allowable Voltage Range (V)	Solenoid Coil Type	Current (A)	Power (W)	Allowable Voltage Range (V)
DC with Built-in Rectifier	E1	AC100	50/60	EAC64-E1-1A	0.31	27	90 to 110	EBB64-E1	0.40	34	90 to 110
	E115	AC110	50/60	EAC64-E115-1A	0.26	25	100 to 125	EBB64-E115	0.33	31	100 to 125
		AC115			0.27	27			0.34	34	
	E2	AC200	50/60	EAC64-E2-1A	0.15	26	180 to 220	EBB64-E2	0.22	37	180 to 220
E230	AC220	50/60	EAC64-E230-1A	0.12	24	200 to 250	EBB64-E230	0.16	30	200 to 250	
	AC230			0.13	27			0.17	33		
DC	D1	DC12	-	EAC64-D1-1A	2.2	26	10.8 to 13.2	EBB64-D1	2.6	31	10.8 to 13.2
	D2	DC24	-	EAC64-D2-1A	1.1	26	21.6 to 26.4	EBB64-D2	1.5	36	21.6 to 26.4

● Solenoid Assembly Specifications (SNH-G03, G04)

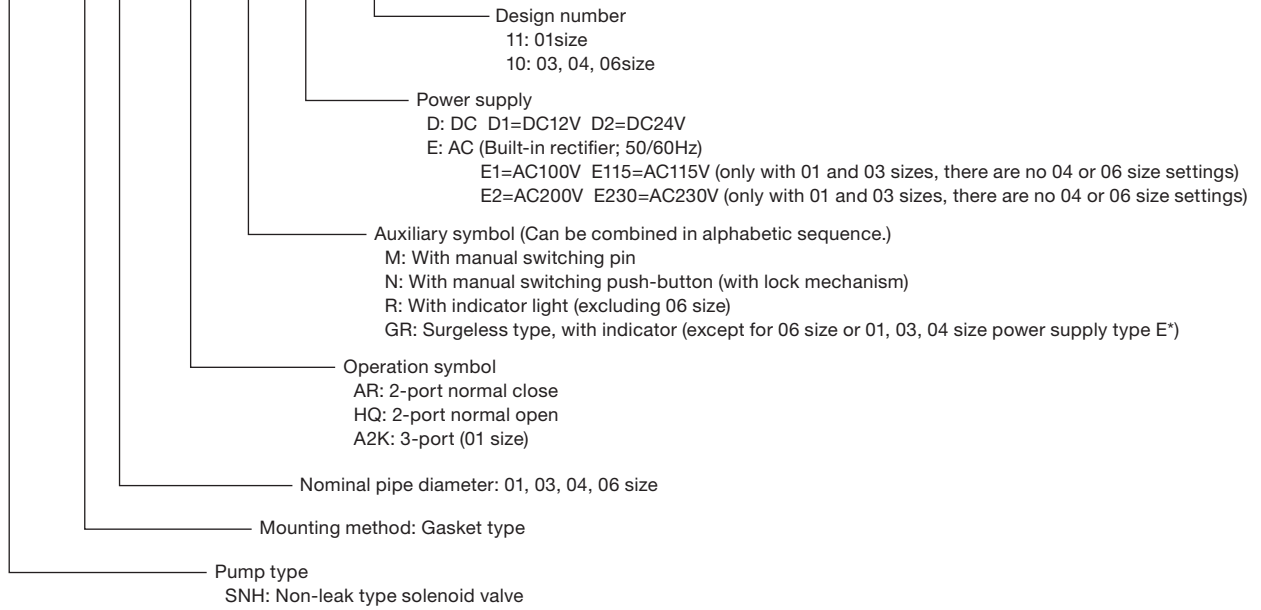
Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SNH-G04			
				Solenoid Coil Type	Current (A)	Power (W)	Allowable Voltage Range (V)
DC with Built-in Rectifier	E1	AC100	50/60	EBB64-E1	0.40	34	90 to 110
	E2	AC200	50/60	EBB64-E2	0.22	37	180 to 220
DC	D2	DC24	-	EBB64-D2	1.5	36	21.6 to 26.4

● Solenoid Assembly Specifications (SNH-G06)

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	For SNH-G06				
				Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)
DC with Built-in Rectifier	E1	AC100	50/60	EBB64-D60	0.71	0.36	33.2	90 to 110
	E2	AC200	50/60	EBB64-D120	0.39	0.19	36.4	180 to 220
DC	D2	DC24	-	EBB64-D17	3.0	1.5	37.4	21.6 to 26.4

Explanation of model No.

SNH - G 01 - AR - * - D2 - 11

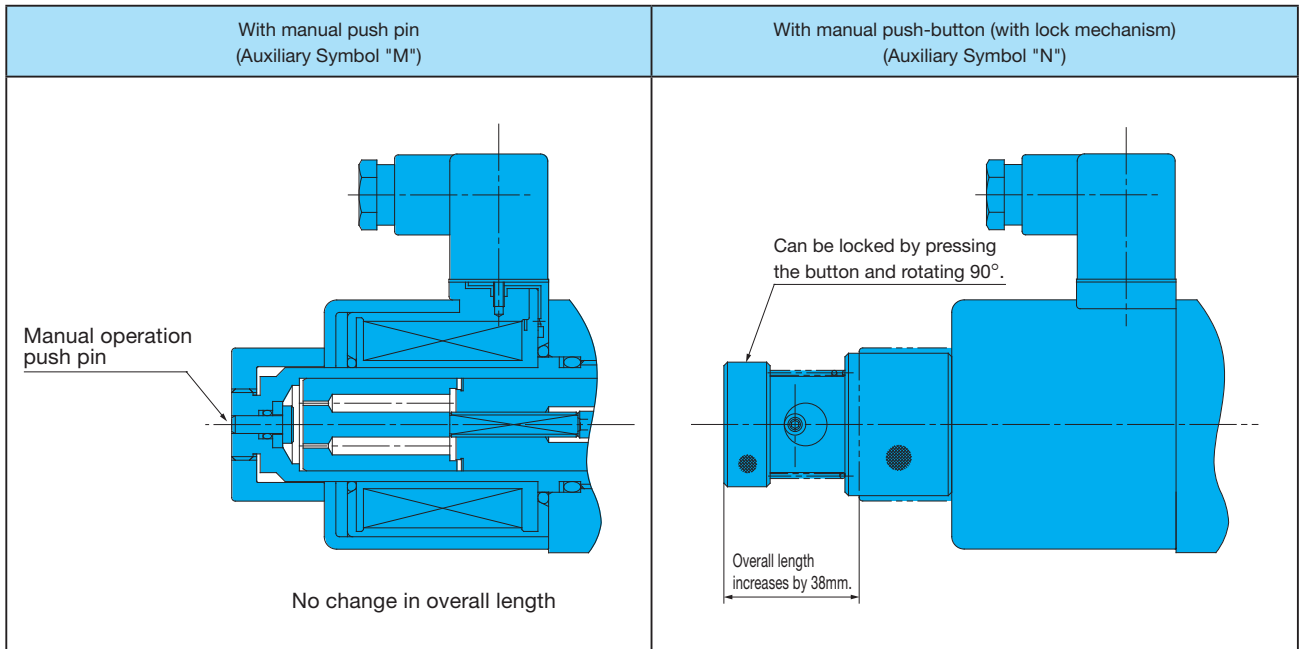


Options

(Auxiliary Symbol)

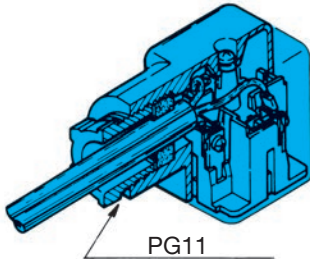
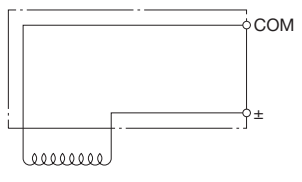
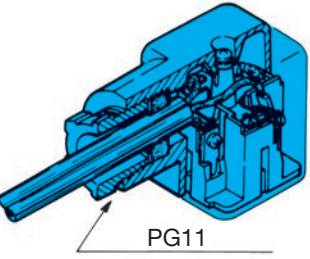
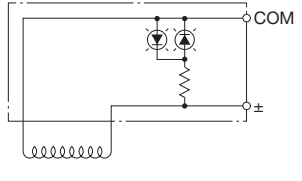
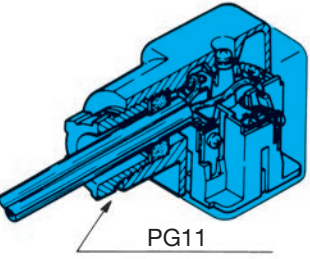
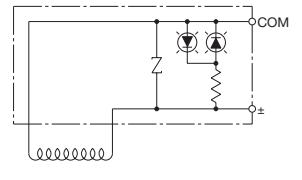
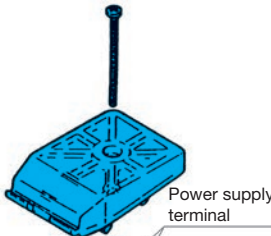
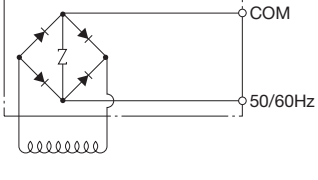
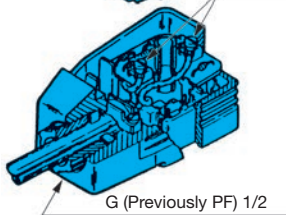
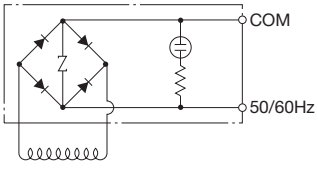
- Select options in accordance with size, as shown in the table to the right.
- (1) The 06 size has an EC connector and a built in surge killer as standard. However, an indicator light is not provided because of space considerations.
- (2) Option N increases the measurement by the size of the pushbutton only.

Auxiliary symbol	M	N	R	GR
Size				
01	○	○	○	○
03	○	○	○	○
04	○	○	○	○
06	○	○	—	—



Electrical Circuits

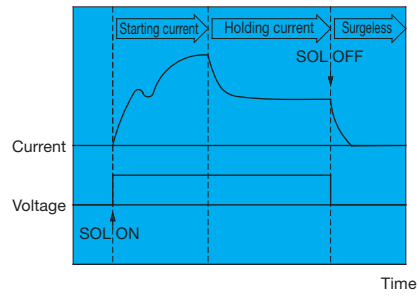
• These electrical circuits are for sizes 01, 03, 04. An EC connector is used for size 06. See the next page for more information.

Valve	Connector Type	Wiring	Electrical Circuit Diagram
G01 G03 G04 Size	EA41-1A (Standard for power supply type D*)	 <p>PG11</p> <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>	
	EA41-DR1/2-1C (D* option: R)	 <p>PG11</p> <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>	
	EA41-GRD1/2-1C (D* option: GR)	 <p>PG11</p> <p>Connect the power supply to terminals No.1 and No. 2. The ⊕ terminal is ground. Use this terminal as required.</p>	
	EA42-1B (For power supply type E*)	 <p>Power supply terminal</p> <p>Connect the power supply to the ⊕ terminals on the board. When ground connection is required, remove the board and use the terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals.</p>	
EA42-R1/2-1B (E* option: R)	 <p>G (Previously PF) 1/2</p> <p>Connect the power supply to the ⊕ terminals on the board. When ground connection is required, remove the board and use the terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals.</p>		

- Note) 1. Connector types 1 and 2 indicate voltage. (1: 100V AC or 12V DC; 2: 200V AC or 24V DC)
 2. Use a connector cord with a diameter that is in the range of $\phi 8$ to $\phi 10$.
 3. The orientation of the connectors can be changed in 90° increments by modifying the terminal block.
 4. The cover cannot be removed unless the installation screws are removed.
 5. Use an M3 type as a solderless terminal.
 6. Tighten the M3 screws that secure connectors and terminals to a torque of 0.3 to 0.5N·m (3 to 5.1kgf·cm).

●06 Size EC Connector

SNH-G06 provides large switching power, so an EC connector is used. During switching, this EC connector supplies twice the current (starting current) that normally flows to the coil (holding current), and drops the current back to normal after switching is complete.

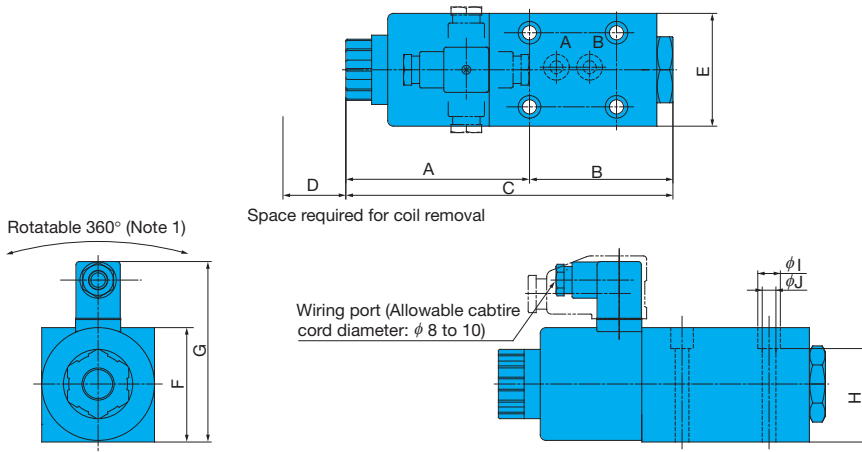


Valve	Connector Type	Wiring	Electrical Circuit Diagram
06 Size	Surgeless Type (24V DC) EC Connector EN41-06D2		<p>Note that correct polarity must be maintained with the power supply.</p>
	Built-in Rectifier EC Connector EN41-06E1/E2	<p>Connect the power supply to the terminals on the board. When ground connection is required, remove the board and use the ⊕ terminal. In this case, do not connect the power supply to the No. 1 and No. 2 terminals. Round type, Y type, and other solderless terminals cannot be used.</p>	

Note) The orientation of the EN41-06** connector cannot be changed at 90° intervals by modifying the terminal block.

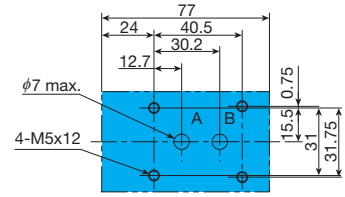
Installation Dimension Drawings

SNH-G**-AR**-**₁₁
10

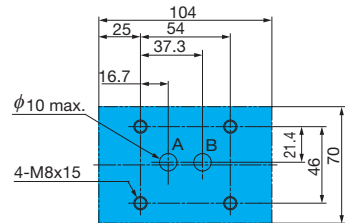


Valve Mounding Surface Dimensions

01-AR/HQ(Conforms to ISO 4401-03-02-0-05)

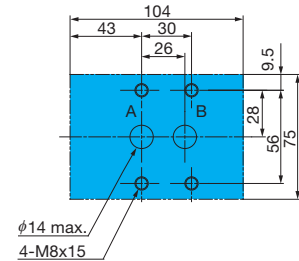


03-AR/HQ(Conforms to ISO 4401-05-04-0-05)

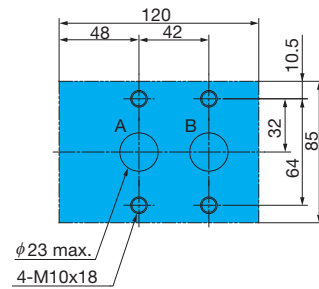


Note) An M6 mounting screw type is not yet available.

04-AR/HQ



06-AR/HQ

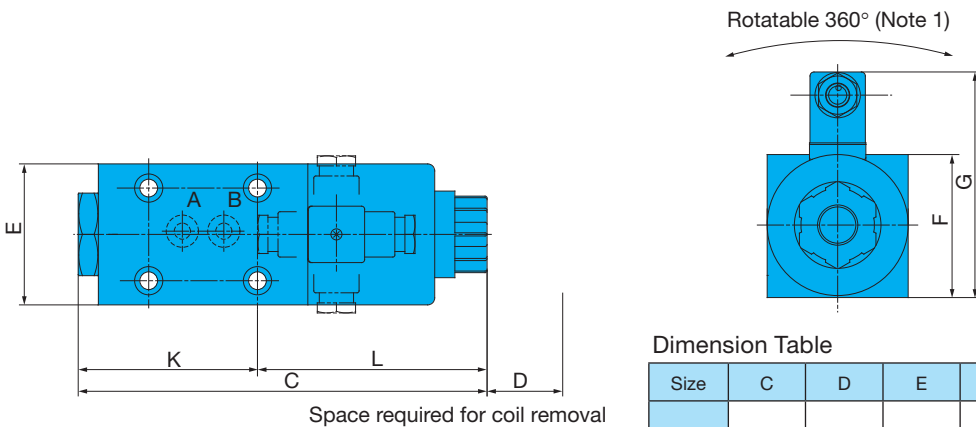


Dimension Table

Size	A	B	C	D	E	F	G(Note) ₂	H	I	J
01	100	60.5	160.5	60.5	46	48	91 (94.5)	37.5	9	5.5
03	114	89	203	63	70	72	112 (115.5)	58	14	8.5
04	132	71	203	63	75	71	112 (115.5)	58	14	8.5
06	137	82	219	63	85	71	115.5	60	18	11

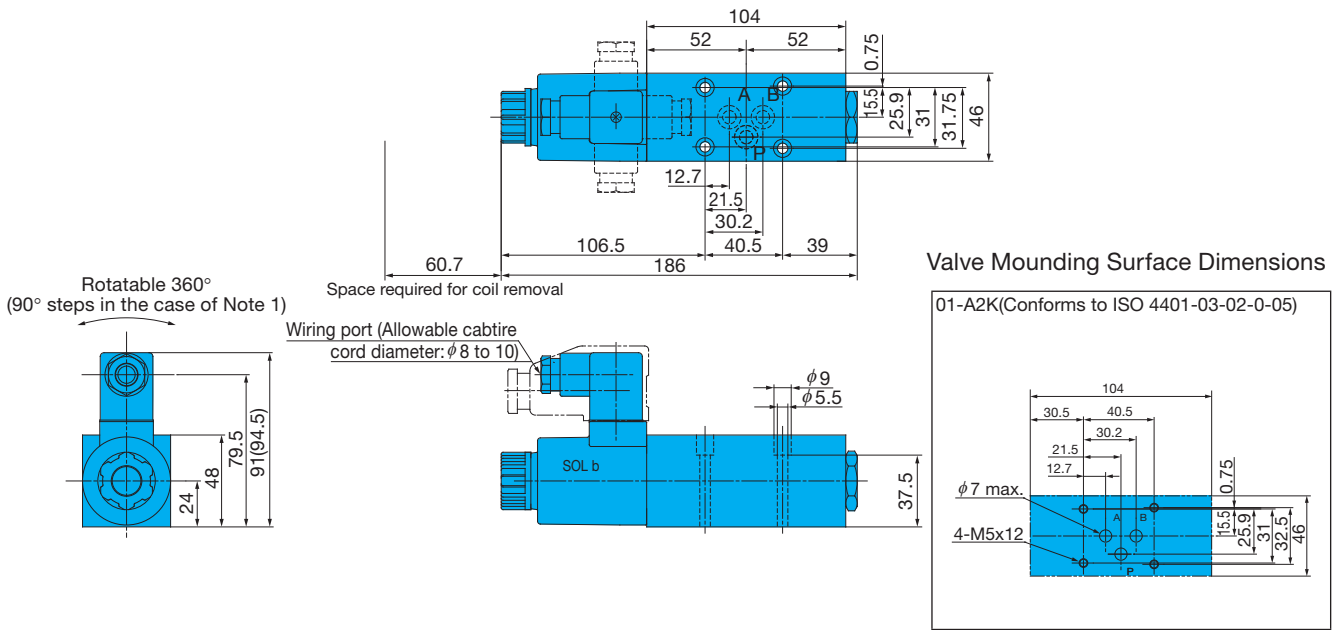
- Note) 1. The 01, 03, 04 size power supply type E* allows rotation at 90° intervals, but the 06 size cannot be rotated.
 2. Values in parentheses are for 01, 03, 04 size power supply type E*.
 3. The P and T ports of the 01, 03 sizes do not have O-ring grooves, so if the manifold has P and T ports, use end plates to close off the valve P and T ports. Contact your agent for information about end plates.

SNH-G**-HQ**-**₁₁
10



Dimension Table

Size	C	D	E	F	G(Note) ₂	K	L
01	160.5	60.5	46	48	91 (94.5)	70.5	90
03	203	63	70	72	112 (115.5)	89	114
04	203	63	75	71	112 (115.5)	83	120
06	219	63	85	71	115.5	100	119



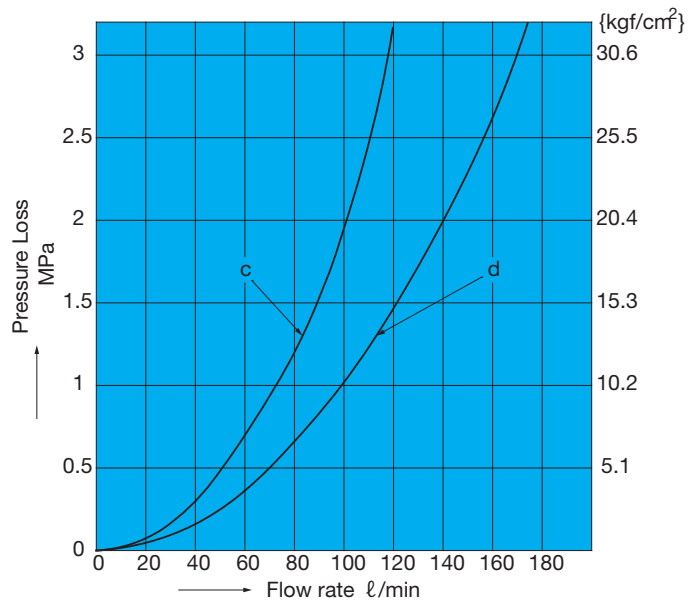
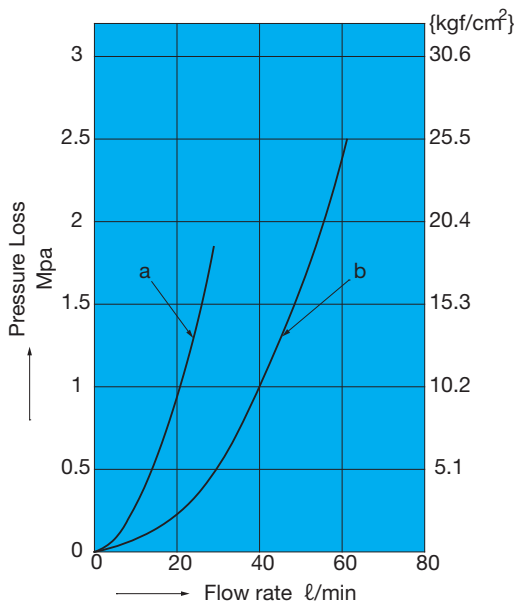
Note) 1. Power supply type E* allows rotation at 90° intervals.
 2. Values in parentheses are for power supply type E*.

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

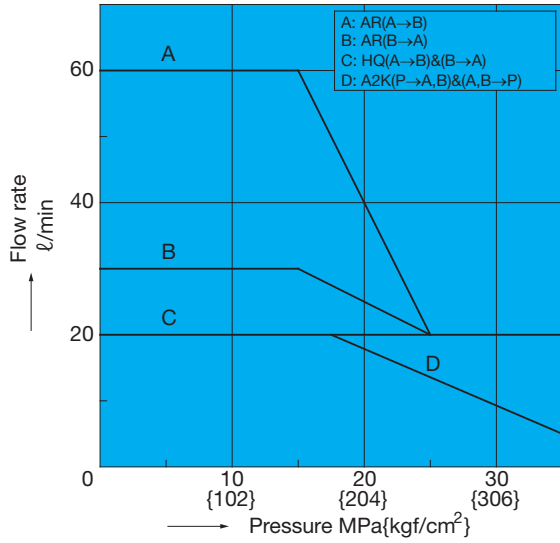
Pressure Loss Characteristics

Flow Path	Size			
	01	03	04	06
A↔B	a	b	c	d
P↔A, P↔B	a	—	—	—

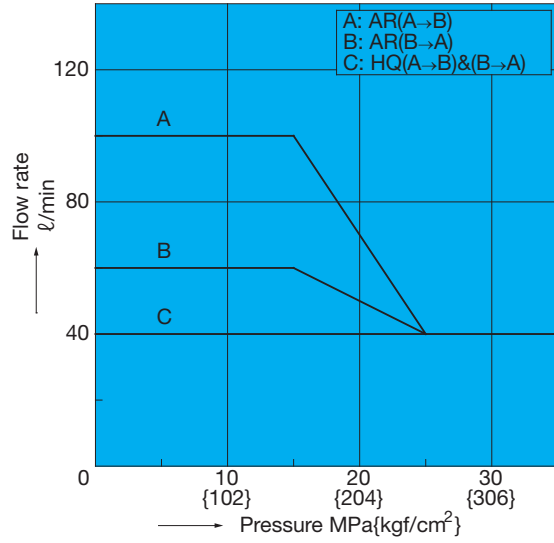


Pressure - Flow Volume Allowable Value

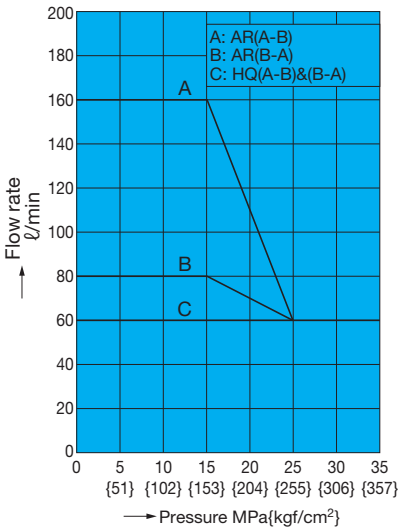
G01 Size



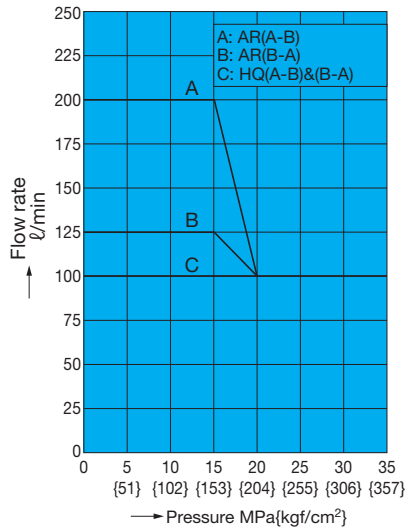
G03 Size



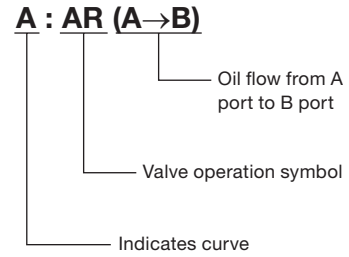
SNH-G04-AR/HQ



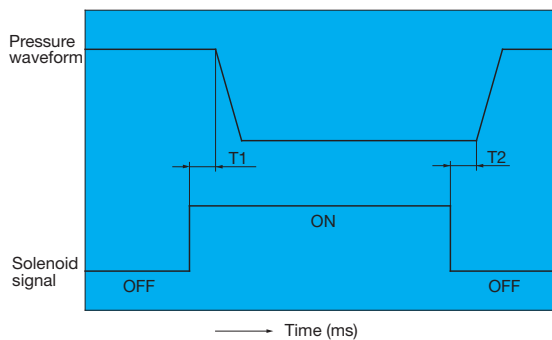
SNH-G06-AR/HQ



Note) Available flow rate values depend on pressure and fluid flow direction. The following shows how to read the data.



Switching Response Time



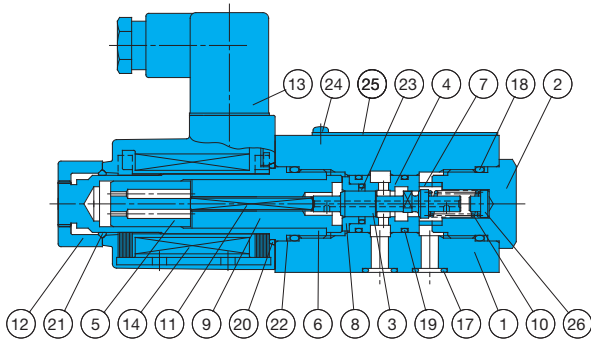
Pressure : 35MPa{357kgf/cm²}
 Flow Rate : 01 : 20l/min
 03 : 40l/min
 04 : 60l/min
 06 : 100l/min
 Operating Fluid : ISO VG68

Size	Power supply	Response Time (SEC)	
		T1 (ON)	T2 (OFF)
01	D*	0.03 to 0.05	0.04 to 0.06
	E*	0.04 to 0.06	0.08 to 0.10
03	D*	0.06 to 0.08	0.04 to 0.06
	E*	0.07 to 0.09	0.08 to 0.10
04	D*	0.09 to 0.11	0.06 to 0.08
	E*	0.12 to 0.14	0.14 to 0.16
06	D*	0.04 to 0.06	0.06 to 0.08
	E*	0.09 to 0.11	0.14 to 0.16

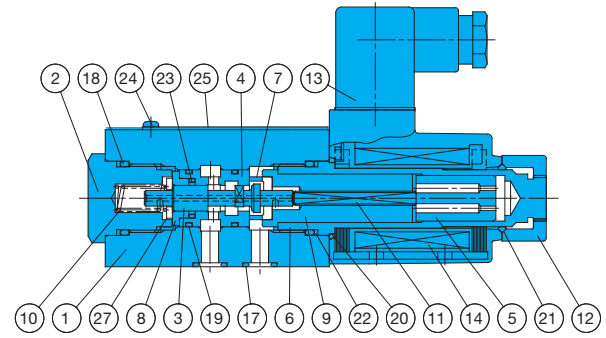
Note) The switching response time changes slightly with operating conditions (pressure, flow rate, viscosity, etc.)

Cross-sectional Drawings

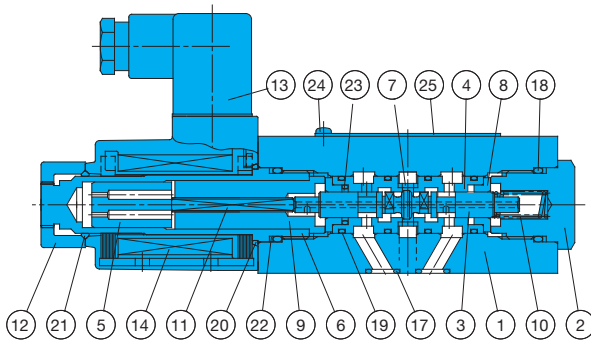
SNH-G01-AR-**-11



SNH-G01-HQ-**-11



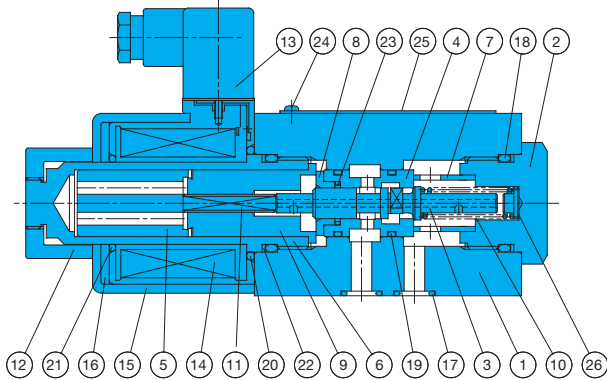
SNH-G01-A2K-**-11



03

SNH-G04-AR-**-10

06

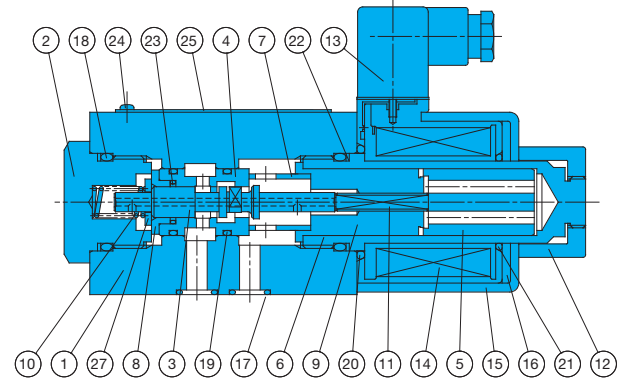


Part No.	Part Name	Part No.	Part Name
1	Body	15	Coil case
2	Plug	16	Coil yoke
3	Poppet	17	O-ring
4	Sleeve	18	O-ring
5	Plunger	19	O-ring
6	Solenoid guide	20	O-ring
7	Ring	21	O-ring
8	Collar	22	Backup ring
9	Solenoid stopper	23	Cap seal
10	Spring	24	Cross recessed head small screw
11	Rod	25	Nameplate
12	Nut	26	Stopper
13	Connector	27	Retainer
14	Solenoid coil		

03

SNH-G04-HQ-**-10

06



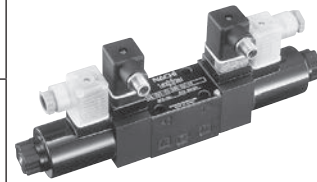
List of Sealing Parts

Part No.	Part Name	01	03	04	06	Q'ty	
						AR,HQ	A2K
17	O-ring	AS568-012(NBR-90)	NBR-90 P12	NBR-90 P16	NBR-90 P28	2	3
18	O-ring	NBR-90 P22	NBR-90 P32	NBR-90 P32	NBR-90 P32	2	2
19	O-ring	AS568-017(NBR-90)	NBR-90 P22	AS568-120(NBR-90)	NBR-90 P26	2	4
20	O-ring	S-25(NBR-70-1)	AS568-029(NBR-70-1)	AS568-029(NBR-70-1)	AS568-029(NBR-70-1)	1	1
21	O-ring	NBR-70-1 P20	AS568-026(NBR-70-1)	AS568-026(NBR-70-1)	AS568-026(NBR-70-1)	1	1
22	Backup ring	T2-P22	T2-P32	T2-P32	T2-P32	2	2
23	Cap seal	*	*	*	*	1	1

Note) The materials and hardness of the O-ring conforms with JIS B2401. Backup ring T2 indicates JIS B 2407-T2.

Parts marked by an asterisk "" are not available on the market. Contact your agent for more information.





SAW Series

Directional control valve with monitoring switch

100ℓ/min
35MPa

Features

This valve is a spool activated directional control valve that uses mechanical detection to operate a switch to send an electric ON/OFF signal. This makes it possible, by monitoring the status of the spool operations, to use it as an information source for safety checks by using the ON/OFF signal as a basis for sequence control. In the future, they will be used in machinery that is compatible with international machine safety (ISO 12100) and JIS standards (JIS B 9700)

standards.

The directional control valve with monitoring switch was developed as a valve to support this demand.

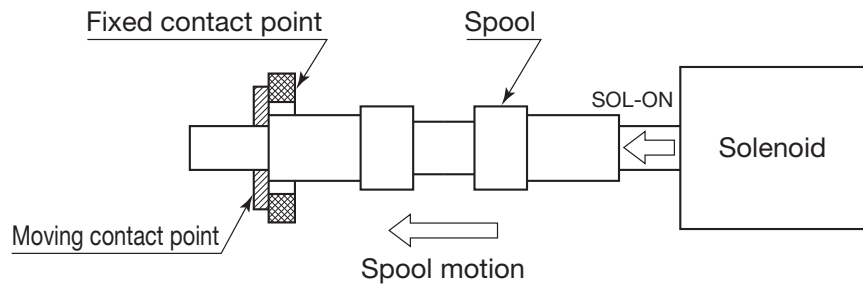
- ① The switch contact has little dead zone and almost no temperature drift (variable motion caused by changes in temperature) or hysteresis because the reaction of the spool action is mechanical.
- ② All valve functions, except for the monitoring function, are equivalent

to the standard solenoid operated directional control valve (SA-G01).

- ③ DIN connectors are used for the switches and solenoid coil wiring so connections are easy when installing or replacing valves.

Operational Principle

When the spool is in the center position, the fixed and moving parts are in contact forming an electric circuit. Operating the solenoid moves the spool so the moving part moves breaking the electric connection between the fixed and moving parts.



Specifications

Model No.		Standard Type		Shockless Type	
JIS Symbol	Operation Symbol	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min
	-A2X-	35{357}	30	25{255}	30
	-A3X-		80		50
	-A5-		100		
	-C1-		80		
	-C5-		100		
	-C6-		80		
	-C1S-		100		
	-C6S-				

Note) The maximum flow rate of each valve depends on the pressure. For details, see page E-72.

●Valve Specifications

		AC Solenoid	DC Solenoid	
			Built-in Rectifier	
Maximum Working Pressure P, A, B ports	Standard Type	35MPa		
	Shockless Type	25MPa		
Maximum Allowable Backpressure T port		21MPa		
Maximum Flow Rate		See pressure-flow characteristics on page E-72 for more information.		
Switching Frequency		120/minute		
Weight	Double Solenoid	2.8kg	3.0kg	
	Single Solenoid	2.1kg	2.2kg	
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP65		
	Operating Fluid	Oil-based operating fluid (Note 1)		
	Ambient Temperature Range	-20 to 50°C		
	Operating Oil Temperature Range	-20 to 70°C		
	Operating Kinematic Viscosity Range	15 to 300mm ² /s		
	Filtration	25 μm or less		
Mounting bolt (Note2)	Size x Length	Socket hex head bolt (12.9 strength classification or equivalent) M5 x 45, 4 each		
	Tightening Torque	5 to 7N·m		

- Note) 1. Use a petroleum based operating fluid because the ON/OFF mechanism of the valve's monitoring switch is immersed in oil and the oil must be a nonconducting fluid.
 Use only petroleum based operating fluid (do not use fluids that are water, glycol, W/O emulsion, phosphate, or fatty ester based).
 Petroleum based operating fluids must also have a water content that is less than 0.1% by volume.
2. Installation bolts are not provided with valves. Use the specified bolts.

●Monitoring Switch Specifications

Voltage Rating	DC24V
Allowable Voltage Range	± 20% of voltage rating
Maximum Current Load	100mA
Residual Voltage (Note 3)	max. 1.2V
Wiring for Connector for Switch	Connect with wires or M12-4 pin connector

- Note) 1. See page E-71 for the procedure to wire the connector for the switch.
 2. The programmable controller input circuits are positive (+) common mode and negative (-) common mode.
 The directional control valve with monitoring switch uses a source circuit [switch on the positive (+) side of the load and power source] for safety purposes.
 Because of this, it is necessary to use a negative (-) common mode programmable controller to receive input from the monitoring switch output.
 3. Set the voltage of the power supply to the monitoring switch within a range that satisfies the following conditions.
 Load ON voltage + residual voltage ≤ switch supply voltage ≤ 28.8 V (+20% voltage rating)
 4. The switch element (photocoupler) in the connector's internal circuit for the monitoring switch may malfunction in the ON state because of over voltage or over current.
 Therefore, in addition to checking the ON output of the monitoring switch, monitor the current at the solenoid and the internal circuits of the connector and valve in conjunction with the switch output.

Condition of monitoring switch output and valve

		Current to Solenoid	
		ON	OFF
Monitoring Switch Output	ON	Abnormal Malfunction at internal circuit of connector or valve	Normal Spool returns to middle position
	OFF	Normal Spool is switching	Abnormal Valve malfunction or signal wire is cut

The monitoring switch outputs according to the motion of the spool, so the solenoid turns on and off according to the output signal which is delayed only as much as the spool operation is delayed.
 Set a 0.3 second delay, including leeway, to monitor the output of the switch.

● Solenoid Specifications

Same specifications as the SA-G01 series (31 design).

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range(V)
AC	C1	AC100	50	EAC64-C1	2.2	0.52	25	80 to 110
			60		2.0	0.38	22	90 to 120
		AC110	60		2.2	0.46	28	
	C115	AC110	50	EAC64-C115	2.0	0.47	25	90 to 120
			60		1.8	0.35	22	100 to 130
		AC115	60		2.0	0.42	28	
	C2	AC200	50	EAC64-C2	1.1	0.26	25	160 to 220
			60		1.0	0.19	22	180 to 240
		AC220	60		1.1	0.23	28	
	C230	AC220	50	EAC64-C230	1.0	0.24	25	180 to 240
			60		0.91	0.17	22	200 to 260
		AC230	60		1.0	0.21	28	
DC with Built-in Rectifier	E1	AC100	50/60	EAC64-E1-1A	0.31		27	90 to 110
		AC110	50/60	EAC64-E115-1A	0.26		25	100 to 125
	AC115	0.27			27			
	E230	AC200	50/60	EAC64-E2-1A	0.15		26	180 to 220
		AC220	50/60	EAC64-E230-1A	0.12		24	200 to 250
AC230	0.13				27			
DC	D1	DC12	—	EAC64-D1-1A	2.2		26	10.8 to 13.2
	D2	DC24	—	EAC64-D2-1A	1.1		26	21.6 to 26.4

● Handling

- 1 In order to realize the full benefits of the wet type solenoid valve, configure piping so oil is constantly supplied to the T port. Never use a stopper plug in the T port.
- 2 Ensure that surge pressure in excess of the maximum allowable back pressure does not reach the T port.
- 3 Note that the maximum flow rate is limited when used as a four-way valve, or by blocking ports for use as a two-way valve or one-way valve.
- 4 Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- 5 Use a JIS K 2213 petroleum-based operating fluid, or an equivalent, that has a water content that is less than 0.1% by volume.
- 6 Do not use fire-resistant operating fluid.
- 7 Use this valve only within the allowable voltage range.
- 8 Do not allow the AC solenoid to become charged until you install the coil into the valve.
- 9 In the case of operation symbol A2X, run drain piping from the valve T port.
- 10 Maintaining a switching position under high pressure for a long period can cause abnormal operation due to hydraulic lockup. Contact your agent when you need to maintain a switching position for a long period.
- 11 Note that manual pin operating pressure changes in accordance with tank line back pressure.
- 12 The solenoid has a pin for switching the spool manually. However, use the cap (option symbol: D) to prevent manual operation for jobs where manual operation would cause a safety problem.
- 13 The only way to prevent misoperation of the monitoring switch caused by noise generated by the solenoid turning on and off is to install the surgeless directional control valve with monitoring switch (option symbol: GR).
(If the solenoid power source is C* and D*)
- 14 Use surgeless specification (with varistor diode) directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.
- 15 The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.
- 16 The connector for the solenoid is the same as for the SA series solenoid valve. See page E-19 for electrical circuit drawings and wiring procedures.
- 17 Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Maximum Working Pressure MPa[kg/cm ²]	Recommended Flow Rate (ℓ/min)	Weight (kg)	Dimension Drawings Page
MSA-01X-10	1/4	25{255}	20	1.2	E-17
MSA-01Y-10	3/8		40		
MSA-01Y-T-10	3/8		40	1.9	D-90

Explanation of model No.

SAW - G 01 - A3X - FGR V - D2 - 11

Design number

Solenoid power supply

C1 : AC100V 50/60Hz, AC110V 60Hz

C115: AC110V 50/60Hz, AC115V 60Hz

C2 : AC200V 50/60Hz, AC220V 60Hz

C230: AC220V 50/60Hz, AC230V 60Hz

D1: DC12V D2 : DC24V

E1: AC100V 50/60Hz E115: AC110/115V 50/60Hz

E2: AC200V 50/60Hz E230: AC220/230V 50/60Hz

Wiring for connector for switch

None: With 350mm wire

V : With M12-4 pin connector

(Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)

Option symbols

None: No options (available with power supply E*)

D : With cap to prevent operation of manual push pin

F : Shockless type (available with power supply D* and E*)

GR : Surgeless type, with indicator light (must be installed with power supply C* and D*)

R : With indicator light (available with power supply E*)

Possible option symbol combinations

Power Supply	Option Symbols
C*	GR, DGR
D*	GR, DGR, FGR, DFGR
E*	None, D, F, DF, R, DR, FR, DFR

Note)

The only way to prevent misoperation of the monitoring switch caused by noise generated by the solenoid turning on and off is to install the surgeless directional control valve with monitoring switch.

(Power supply E* is the standard surgeless type, option symbol G is not needed.)

Operation Symbol

A2X		C5	
A3X		C6	
A5		C1S	
C1		C6S	

Nominal diameter
01 size

Mounting method
G: Cascade mounting

Directional control valve with monitoring switch (DIN connector type)

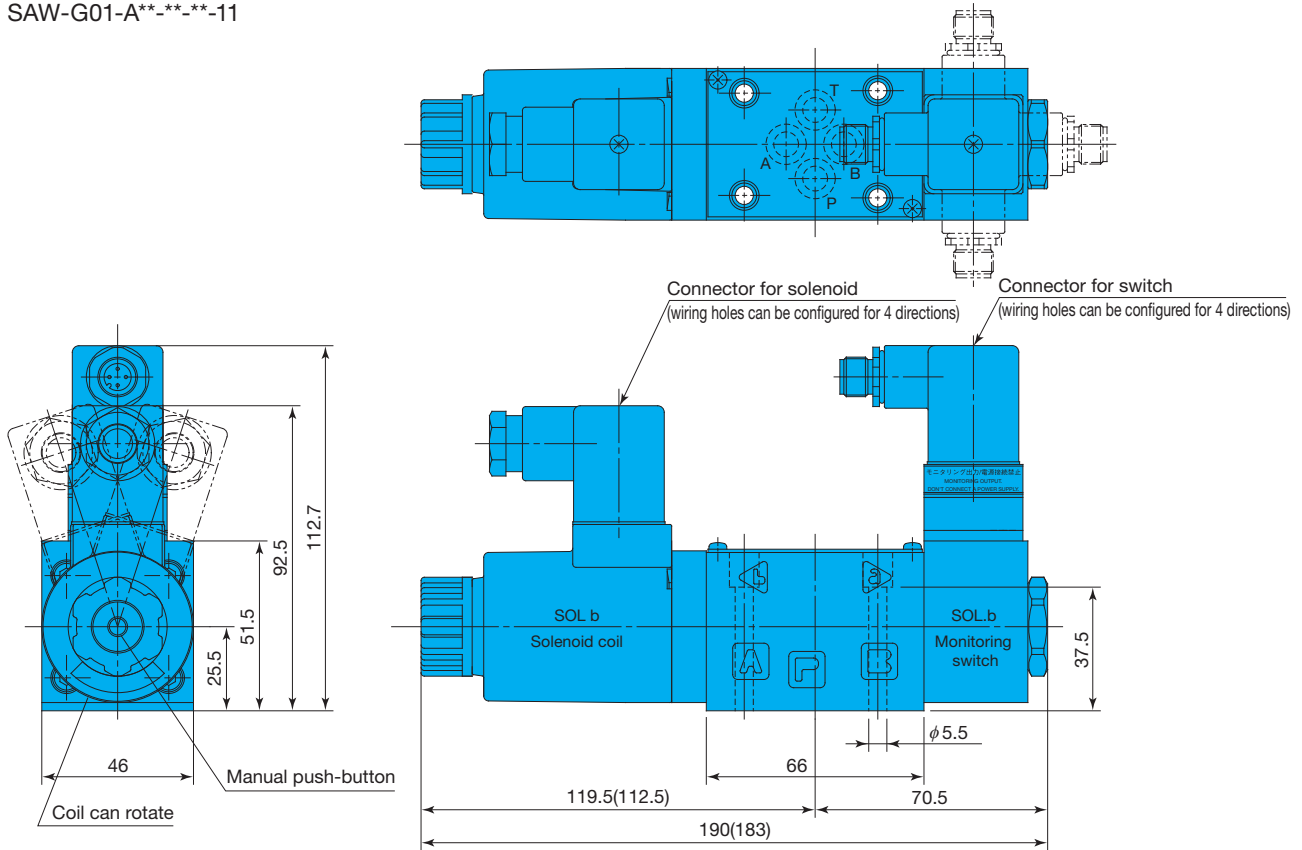
Note) See page E-4 for an explanation of the shockless type (option symbol F) and surgeless type (option symbol G).



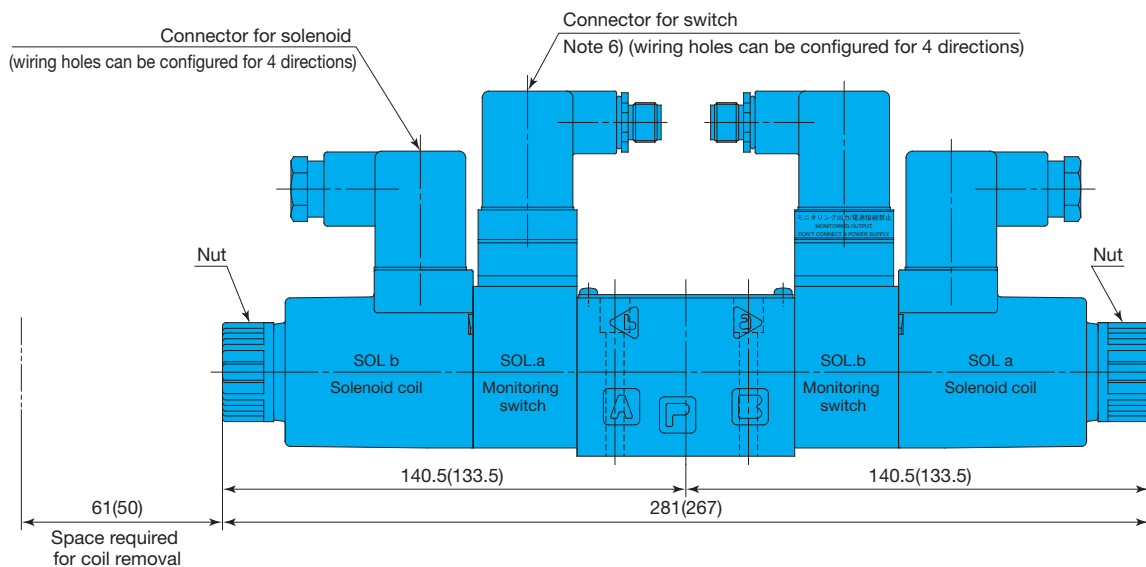
Installation Dimension Drawings

Dimensions of installation surface of gasket are ISO 4401-03-02-0-05.

SAW-G01-A**-**-**-11



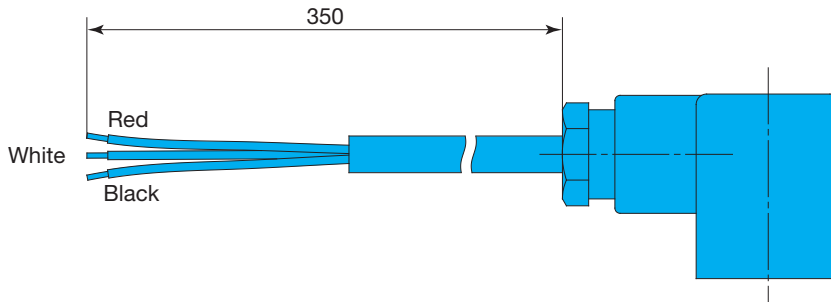
SAW-G01-C**-**-**-11



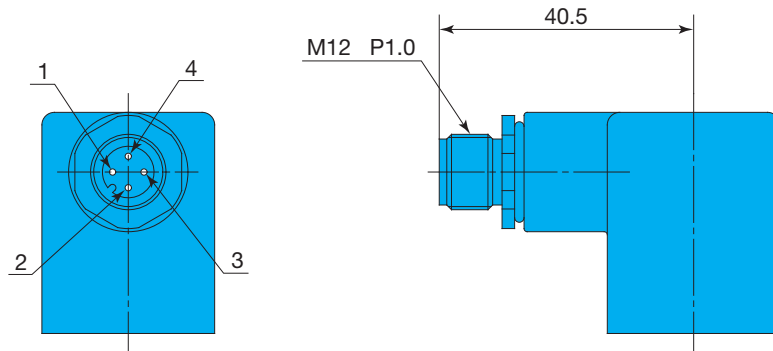
- Note)
1. Dimensions in parentheses apply in the case of an AC solenoid.
 2. For option symbol D (with cap to prevent manual operation), the nut for fixing coil is 5mm long. Include this length when calculating the total length of the valve.
 3. The connector for the switch in the drawing above is the M12-4 pin connector. In addition there are wire connections also. See page E-71 for more detailed information.
 4. The wiring hole for the connector is oriented as shown in the diagram for packaging purposes. The orientation can be changed according to the direction of the wiring.
 5. Use surgeless directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.
 6. To orient the wiring hole for the connector for the switch towards the solenoid coil, loosen the nut and rotate the solenoid coil so the connector for the switch does not interfere with the connector for the solenoid.

● Details about the Connector for the Switch

(1) With wiring (option symbol: none)

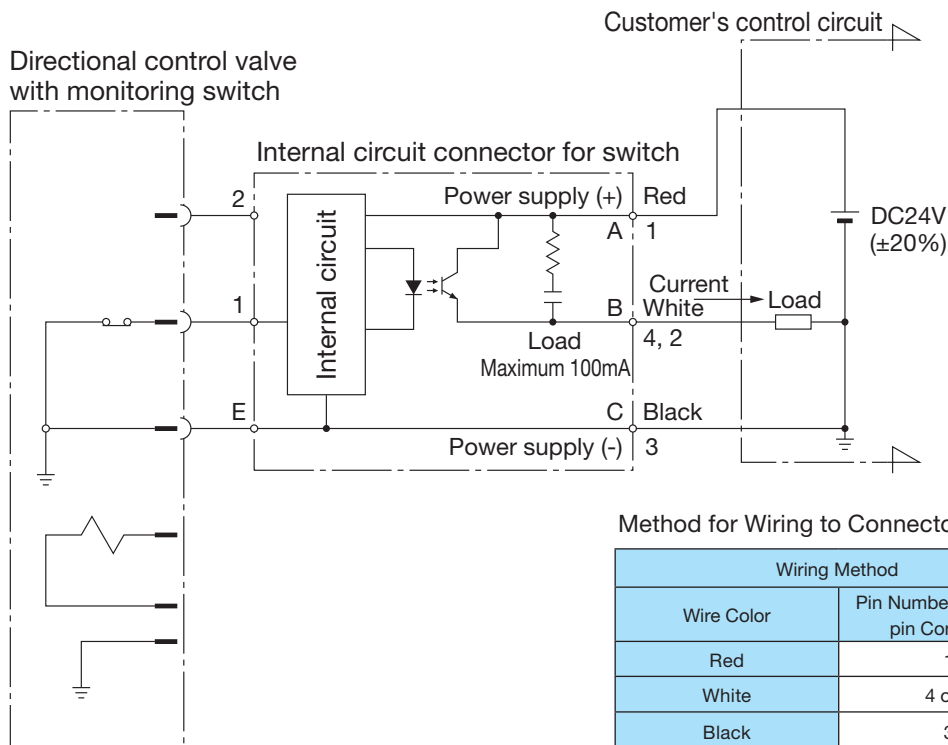


(2) With M12-4 pin connector (option symbol: V)



Note) 1. The pin connector is screwed to the housing so it is rotated a certain amount compared to the drawing. Refer to the electrical circuit diagram below for how to connect it.
 2. The connector that the M12-4 pin connector connects to is not provided. (Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)

(3) Electrical circuit diagram



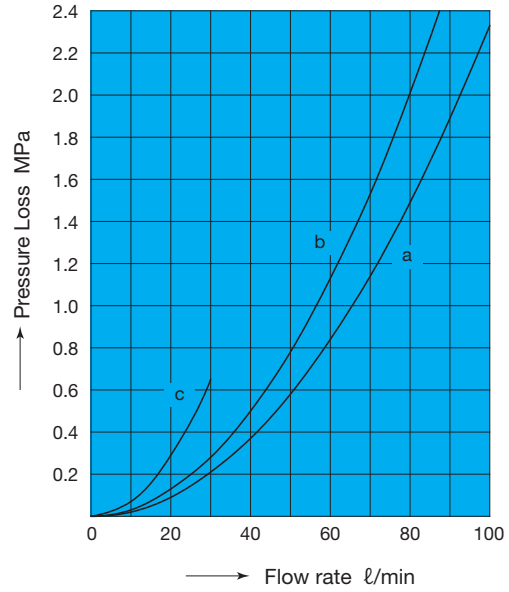
Note) 3. Always install a diode to prevent surges in the current when connecting an inductive load, such as a relay, to the monitoring switch.
 4. Do not modify or replace the lead wires.
 5. Connect the load for the M12-4 pin connector to either pin number 4 or 2.
 6. When connecting monitoring switches in sequence, use the negative (-) common mode (type that current runs to sequence side).

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

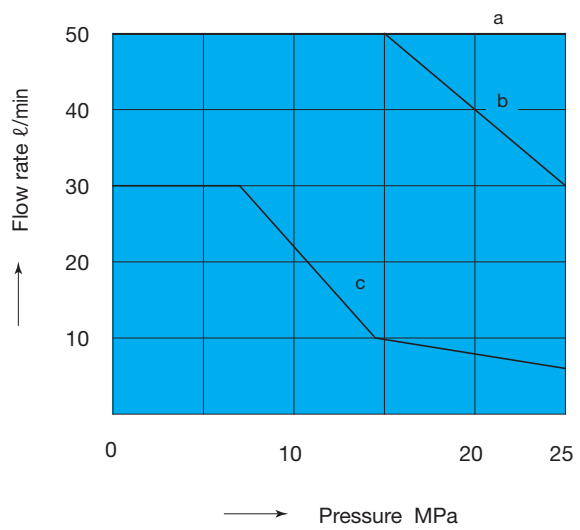
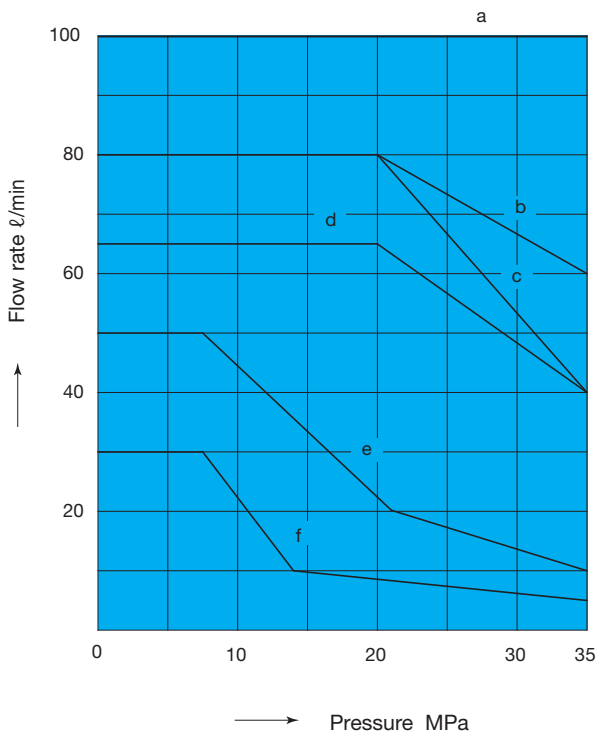
Operation Symbol	P → A	P → B	A → T	B → T
A2X	c	c	—	—
A3X	b	b	b	b
A5	—	b	b	—
C1	b	b	a	b
C5	b	b	b	b
C6	b	b	a	a
C1S	b	b	b	b
C6S	b	b	b	b



Pressure — Flow Volume Allowable Value

Operation Symbol	Standard Form, with AC, DC solenoid		
A2X	—	f	f
A3X	b	f	f
A5	a	—	e
C1	AC SOL. d DC SOL. c	e	e
C5	a	e	e
C6	AC SOL. d DC SOL. c	e	e
C1S	a	e	e
C6S	a	e	e

Operation Symbol	Shockless Type, with DC solenoid		
A2X	—	c	c
A3X	a	c	c
A5	a	—	c
C1	b	c	c
C5	a	c	c
C6	b	c	c
C1S	a	c	c
C6S	a	c	c

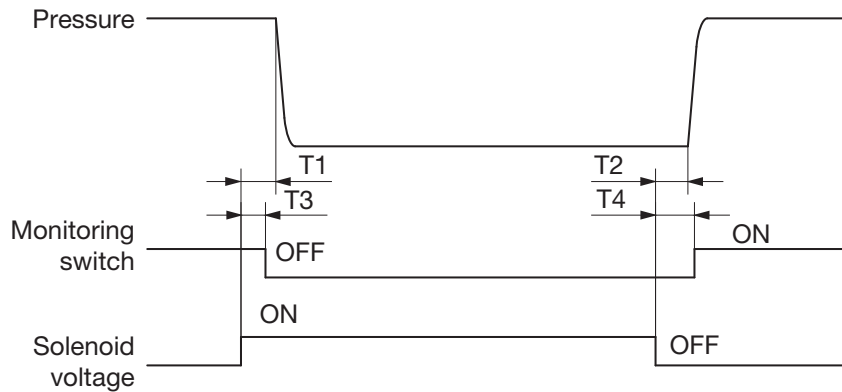


Range of Motion of Switch

Positions		Stroke of Spool		
		SOL.b ON	Center	SOL.a ON
Flow Path				
Motion of Switch	SOL.b Monitoring Switch	OFF		ON
	SOL.a Monitoring Switch	ON		OFF

Note) 1. Flow path is C5 type (all-port-block), other flow paths also activate switch in middle position.
 2. ON and OFF indicate the state of the output transistor on the circuit board in the connector.

Switching Responsiveness



Type of Machine	Model	Response Time (s)				
		Pressure		Switch		
		T1	T2	T3	T4	
AC Solenoid	SAW-G01-C5-GR-C1-11	0.02 to 0.03	0.02 to 0.03	0.01 to T1	T2 to 0.05	
DC Solenoid	Standard Type	SAW-G01-C5-GR-D2-11	0.03 to 0.04	0.02 to 0.04	0.01 to T1	T2 to 0.06
	Built-in Rectifier Type	SAW-G01-E1-11	0.03 to 0.04	0.07 to 0.10	0.01 to T1	T2 to 0.15
	Shockless Type	SAW-G01-C5-FGR-D2-11	0.07 to 0.10	0.04 to 0.07	0.02 to T1	T2 to 0.10
	Built-in Rectifier Type Shockless Type	SAW-G01-C5-F-E1-11	0.07 to 0.10	0.10 to 0.15	0.02 to T1	T2 to 0.20

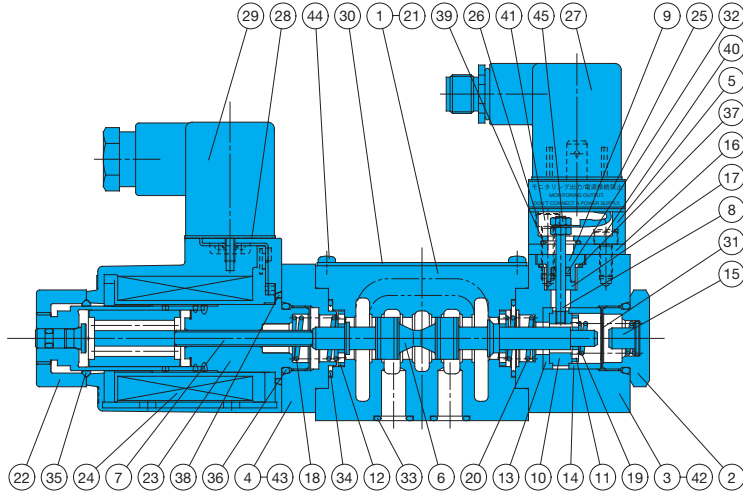
Note) May vary depending on switching response time and operating conditions (pressure, flow rate, and oil temperature).

[Measurement Conditions]

Pressure 14MPa
 Flow Rate 30l/min
 Operating fluid ISO VG32 40°C

Cross-sectional Drawings

SAW-G01-A**-**-**-11



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Plate (connector)	31	Wave washer
2	Plug	17	Collar (insulated)	32	O-ring *
3	Cover (switch)	18	Spring (one SOL. guide side)	33	O-ring *
4	Cover (one SOL.)	19	Spring (one SOL. contact side)	34	O-ring *
5	Cover (connector)	20	Spring (main unit)	35	O-ring *
6	Spool	21	Spacer	36	O-ring *
7	Rod (guide)	22	Nut	37	O-ring *
8	Rod (conductor)	23	Solenoid guide	38	O-ring *
9	Bush (insulated)	24	Solenoid coil	39	O-ring *
10	Retainer (fixed contact)	25	Connector with lead wire	40	Hexagon socket head bolt
11	Retainer (movable contact)	26	Packing	41	Hexagon socket head bolt
12	Retainer (main unit)	27	Connector with built-in photo-coupler	42	Hexagon socket head bolt
13	Ring (insulation inside)	28	Connector packing	43	Hexagon socket head bolt
14	Ring (insulation outside)	29	Connector	44	Phillips pan head screw
15	Stopper	30	Nameplate	45	Hexagon nut

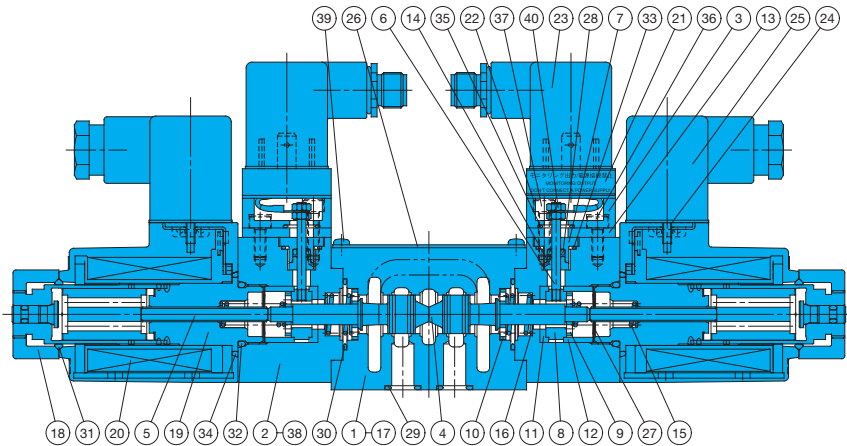
Seal Part List (Kit Model Number EQS-01A)

Part No.	Part Name	Part Number	Q'ty
32	O-ring	NBR-90 P3	1
33	O-ring	AS568-012(NBR-90)	4
34	O-ring	AS568-019(NBR-90)	2
35	O-ring	NBR-70-1 P20	1
36	O-ring	NBR-90 P18	2
37	O-ring	S-11.2(NBR-90)	1
38	O-ring	S25(NBR-70-1)	1
39	O-ring	S-9(NBR-70-1)	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

For details about parts marked with an asterisk "*", refer to the list of seals in the table on the right.

SAW-G01-C**-**-**-11



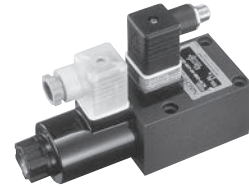
Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Spring (main unit)	31	O-ring *
2	Cover (sensor)	17	Spacer	32	O-ring *
3	Cover (connector)	18	Nut	33	O-ring *
4	Spool	19	Solenoid guide	34	O-ring *
5	Rod (DC guide)	20	Solenoid coil	35	O-ring *
6	Rod (conductor)	21	Connector with lead wire	36	Hexagon socket head bolt
7	Bush (insulated)	22	Packing	37	Hexagon socket head bolt
8	Retainer (fixed contact)	23	Connector with built-in photo-coupler	38	Hexagon socket head bolt
9	Retainer (movable contact)	24	Connector packing	39	Phillips pan head screw
10	Retainer (main unit)	25	Connector	40	Hexagon nut
11	Ring (insulation inside)	26	Nameplate		
12	Ring (insulation outside)	27	Wave washer		
13	Plate (connector)	28	O-ring *		
14	Collar (insulated)	29	O-ring *		
15	Spring (one SOL. contact side)	30	O-ring *		

Seal Part List (Kit Model Number EQS-01C)

Part No.	Part Name	Part Number	Q'ty
28	O-ring	NBR-90 P3	2
29	O-ring	AS568-012(NBR-90)	4
30	O-ring	AS568-019(NBR-90)	2
31	O-ring	NBR-70-1 P20	2
32	O-ring	NBR-90 P18	2
33	O-ring	S-11.2(NBR-90)	2
34	O-ring	S-25(NBR-70-1)	2
35	O-ring	S-9(NBR-70-1)	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

For details about parts marked with an asterisk "*", refer to the list of seals in the table on the right.



SCW Series

Poppet type directional control valve with monitoring switch

50ℓ/min
21MPa

Features

This valve is a poppet activated directional control valve that uses mechanical detection to operate a switch to send an electric ON/OFF signal. This makes it possible, by monitoring the status of the spool operations, to use it as an information source for safety checks by using the ON/OFF signal as a basis for sequence control. In the future, they will be used in machinery that is compatible with international machine safety (ISO 12100) and JIS standards (JIS B 9700)

standards.

The poppet type directional control valve with monitoring switch was developed as a valve to support this demand.

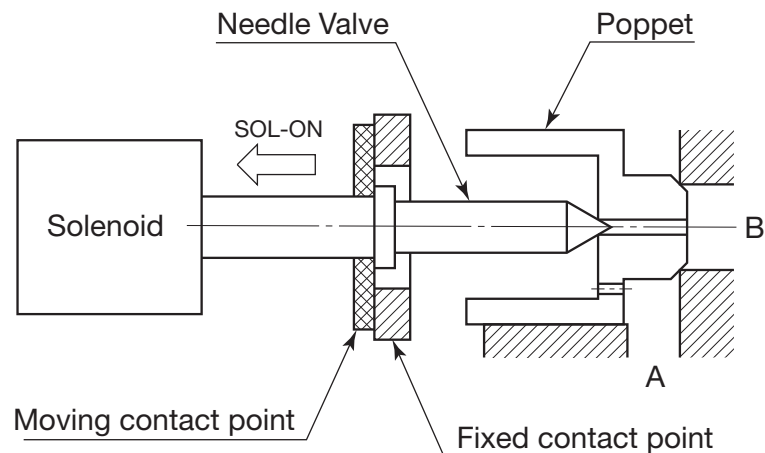
- ①The switch contact has little dead zone and almost no temperature drift (variable motion caused by changes in temperature) or hysteresis because the reaction of the poppet action is mechanical.
- ②All valve functions, except for the monitoring function, are equivalent to

the standard poppet type directional control valve.

- ③DIN connectors are used for the switches and solenoid coil wiring so connections are easy when installing or replacing valves.

Operational Principle

When the needle valve is in the center position, the fixed and moving parts are in contact forming an electric circuit. The solenoid turns on, the needle valve operates so there is no circuit between the fixed and moving parts.



Specifications

●Valve Specifications

Operation Symbol		-AR-	-ARC-
JIS Symbol			
Maximum Working Pressure (A, B ports)		21MPa	
Maximum Flow Rate	A → B	50ℓ/min	50ℓ/min
	B → A	—	
Cracking Pressure of Check Valve		0.3MPa	
Switching Frequency		120/minute	
Weight		2.3kg	
Operating Environment	Dust Resistance/Water Resistance Rank	JIS C 0920 IP65	
	Operating Fluid	Oil-based operating fluid (Note 1)	
	Ambient Temperature Range	-20 to 50°C	
	Operating Oil Temperature Range	-20 to 70°C	
	Operating Kinematic Viscosity Range	15 to 300mm ² /s	
Filtration		25μm or less	
Mounting bolt (Note2)	Size × Length	Socket hex head bolt (12.9 strength classification or equivalent) M6 × 55, 4 each	
	Tightening Torque	10 to 13N·m	

Note) 1. Use a petroleum based operating fluid because the ON/OFF mechanism of the valve's monitoring switch is immersed in oil and the oil must be a nonconducting fluid.

Use only petroleum based operating fluid (do not use fluids that are water, glycol, W/O emulsion, phosphate, or fatty ester based). Petroleum based operating fluids must also have a water content that is less than 0.1% by volume.

2. Installation bolts are provided with valves.

●Monitoring Switch Specifications

Voltage Rating	DC24V
Allowable Voltage Range	± 20% of voltage rating
Maximum Current Load	100mA
Residual Voltage (Note 3)	max. 1.2V
Wiring for Connector for Switch	Connect with wires or M12-4 pin connector

- Note) 1. See page E-78 for the procedure to wire the connector for the switch.
 2. The programmable controller input circuits are positive (+) common mode and negative (-) common mode.
 The directional control valve with monitoring switch uses a source circuit [switch on the positive (+) side of the load and power source] for safety purposes.
 Because of this, it is necessary to use a negative (-) common mode programmable controller to receive input from the monitoring switch output.
 3. Set the voltage of the power supply to the monitoring switch within a range that satisfies the following conditions.
 Load ON voltage + residual voltage ≤ switch supply voltage ≤ 28.8 V (+20% voltage rating)
 4. The switch element (photocoupler) in the connector's internal circuit for the monitoring switch may malfunction in the ON state because of over voltage or over current.
 Therefore, in addition to checking the ON output of the monitoring switch, monitor the current at the solenoid and the internal circuits of the connector and valve in conjunction with the switch output.

Condition of monitoring switch output and valve

		Current to Solenoid				
		ON	OFF			
Monitoring Switch Output	ON	Abnormal Malfunction at internal circuit of connector or valve	Normal Needle valve returns to middle position			
	OFF	Normal Needle valve is switching	<table border="1"> <tr> <td>Pressure from A port (Closed)</td> <td>Abnormal Valve malfunction or signal wire is cut</td> </tr> <tr> <td>Pressure from B port (Flows from B → A port)</td> <td>Normal Poppet opens and needle valve operates</td> </tr> </table>	Pressure from A port (Closed)	Abnormal Valve malfunction or signal wire is cut	Pressure from B port (Flows from B → A port)
Pressure from A port (Closed)	Abnormal Valve malfunction or signal wire is cut					
Pressure from B port (Flows from B → A port)	Normal Poppet opens and needle valve operates					

The monitoring switch outputs according to the motion of the spool, so the solenoid turns on and off according to the output signal which is delayed only as much as the spool operation is delayed.
 Set a 0.3 second delay, including leeway, to monitor the output of the switch.

●Solenoid Specifications

Same specifications as the SA-G01 series (31 design).

Solenoid Type	Power Supply Type	Voltage (V)	Frequency (Hz)	Solenoid Coil Type	Drive Current (A)	Holding Current (A)	Holding Power (W)	Allowable Voltage Range (V)
DC with Built-in Rectifier	E1	AC100	50/60	EAC64-E1-1A	0.31		27	90 to 110
	E115	AC110	50/60	EAC64-E115-1A	0.26		25	100 to 125
		AC115			0.27		27	
	E2	AC200	50/60	EAC64-E2-1A	0.15		26	180 to 220
	E230	AC220	50/60	EAC64-E230-1A	0.12		24	200 to 250
		AC230			0.13		27	
DC	D1	DC12	—	EAC64-D1-1A	2.2		26	10.8 to 13.2
	D2	DC24	—	EAC64-D2-1A	1.1		26	21.6 to 26.4

●Handling

- Do not allow abnormal surges greater than the maximum operating pressure to occur because pressure from the B port is used for the solenoid.
- Always keep the operating fluid clean. Allowable contamination is class NAS12 or less.
- Use a JIS K 2213 petroleum-based operating fluid, or an equivalent, that has a water content that is less than 0.1% by volume.
- Do not use fire-resistant operating fluid.
- Use this valve only within the allowable voltage range.
- The only way to prevent misoperation of the monitoring switch caused by noise generated by the solenoid turning on and off is to install the surgeless directional control valve with monitoring switch (option symbol: GR).

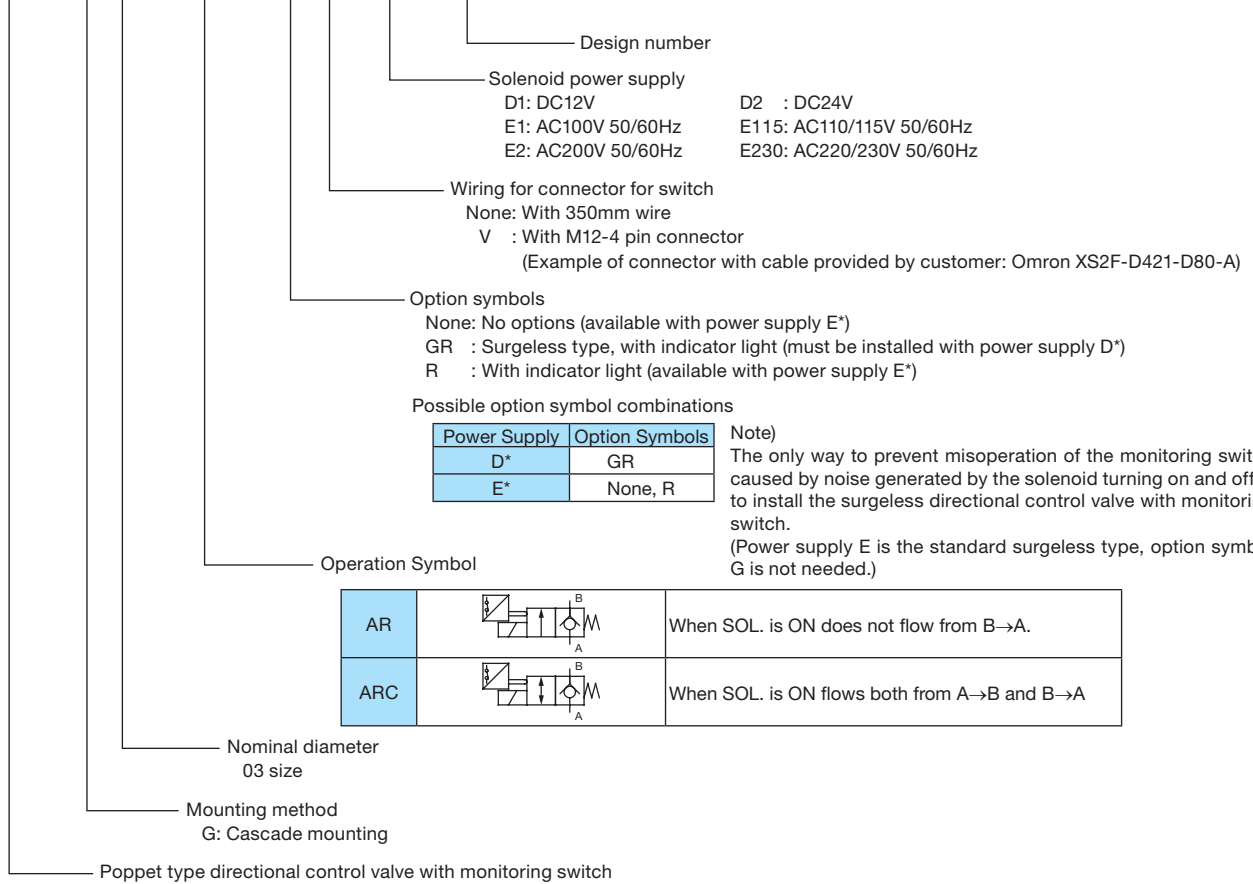
- (If the solenoid power source is C* and D*)
- Use surgeless specification (with varistor diode) directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.
 - The coil surface temperature increases if this valve is kept continuously energized. Install the valve so there is no chance of it being touched directly by hand.

- The connector for the solenoid is the same as for the SA series solenoid valve. See page E-19 for electrical circuit drawings and wiring procedures.
- Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate (ℓ/min)	Weight (kg)	Dimension Drawings Page
MSA-03-10	3/8	25(255)	45	2.3	E-18
MSA-03X-10	1/2		80		
MSA-03-T-10	3/8		45	3.8	D-90
MSA-03X-T-10	1/2		80		

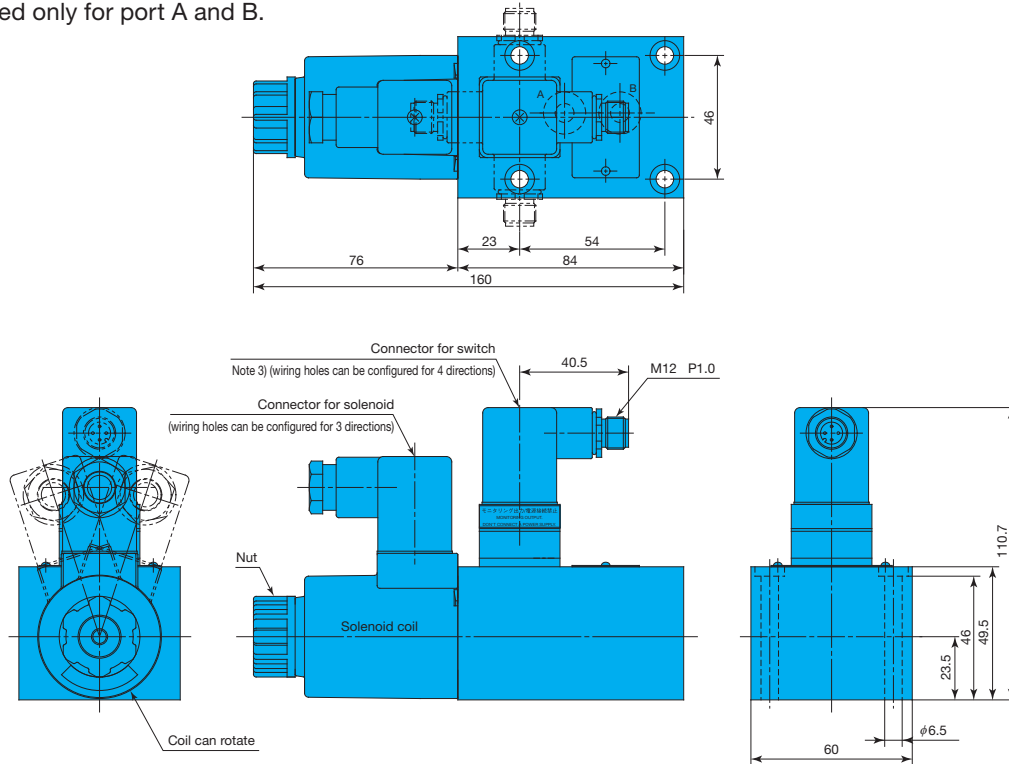
Explanation of model No.

SCW - G 03 - ARC - GR V - D2 - J11



Installation Dimension Drawings

Dimensions of installation surface of gasket are ISO 4401-05-04-0-05.
However, used only for port A and B.

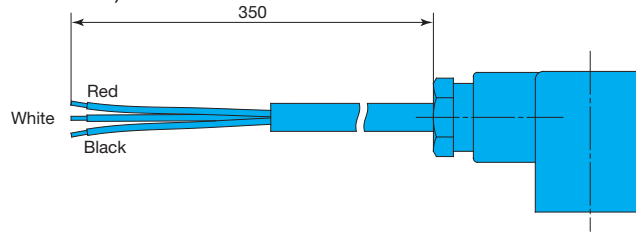


Note) 1. The connector for the switch in the drawing above is the M12-4 pin connector. In addition there are wire connections also.
See page E-78 for more detailed information.

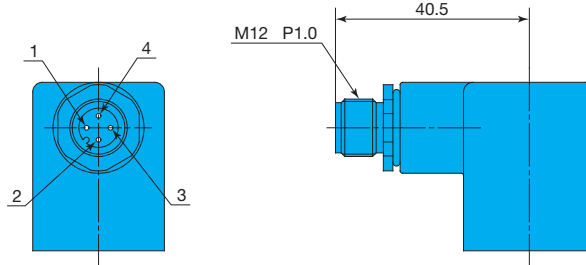
2. Use surgeless directional control valves with monitoring switches for all electric valves on the same machine to prevent misoperation of the monitoring switch caused by noise when the solenoid turns on and off.
3. To orient the wiring hole for the connector for the switch towards the solenoid coil, loosen the nut and rotate the solenoid coil so the connector for the switch does not interfere with the connector for the solenoid.

●Details about the Connector for the Switch

(1) With wiring (option symbol: none)

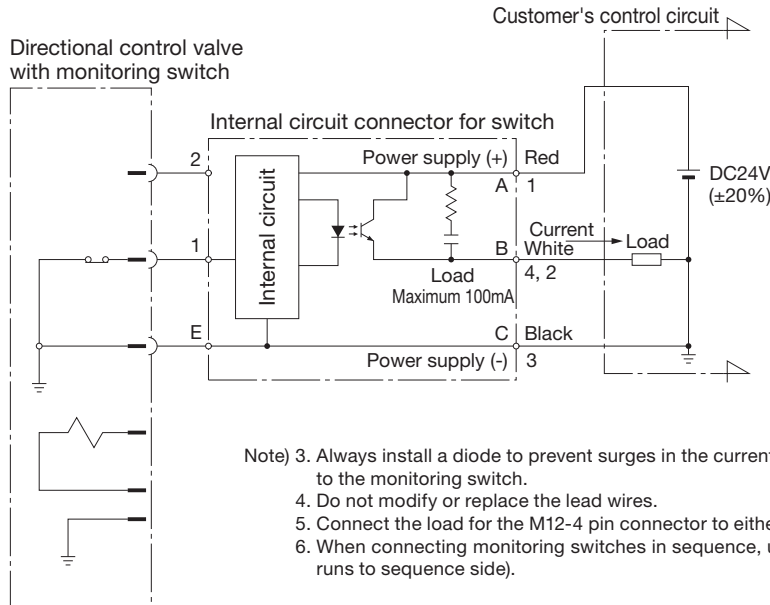


(2) With M12-4 pin connector (option symbol: V)



- Note) 1. The pin connector is screwed to the housing so it is rotated a certain amount compared to the drawing. Refer to the electrical circuit diagram below for how to connect it.
 2. The connector that the M12-4 pin connector connects to is not provided.
 (Example of connector with cable provided by customer: Omron XS2F-D421-D80-A)

(3) Electrical circuit diagram



Method for Wiring to Connector with Switch

Wiring Method		Connection
Wire Color	Pin Number for M12-4 pin Connector	
Red	1	Power supply (+)
White	4 or 2	Load
Black	3	Power supply (-)

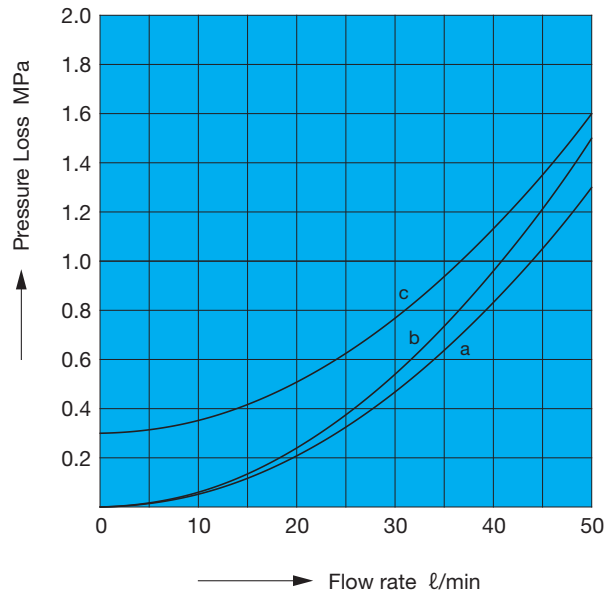
- Note) 3. Always install a diode to prevent surges in the current when connecting an inductive load, such as a relay, to the monitoring switch.
 4. Do not modify or replace the lead wires.
 5. Connect the load for the M12-4 pin connector to either pin number 4 or 2.
 6. When connecting monitoring switches in sequence, use the negative (-) common mode (type that current runs to sequence side).

Performance Curves




Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

Operation Symbol	JIS Symbol	SOL OFF B → A	SOL ON	
			A → B	B → A
AR		c	a	—
ARC		c	a	b



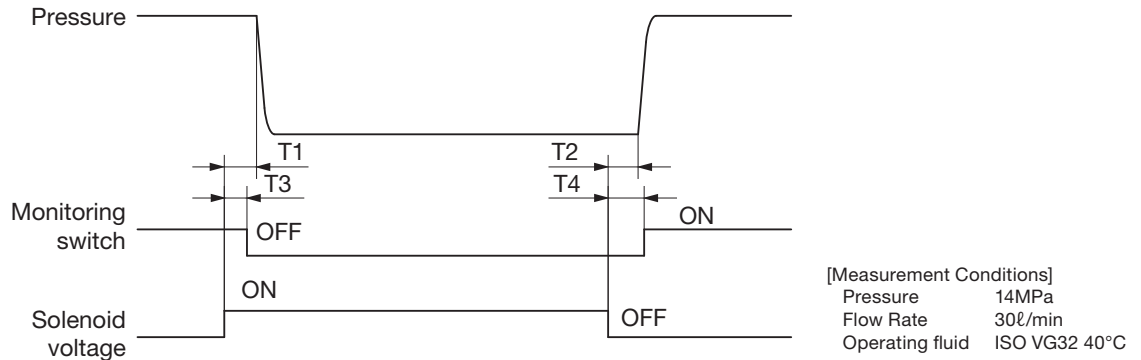
Range of Motion of Switch

Positions	Stroke of Poppet		
	SOL. ON	Switching Transition	Center
Flow Path			
Motion of Switch	OFF		ON

Note) 1. Internal leak exists at  of switching transition period.

2. ON and OFF indicate the state of the output transistor on the circuit board in the connector.

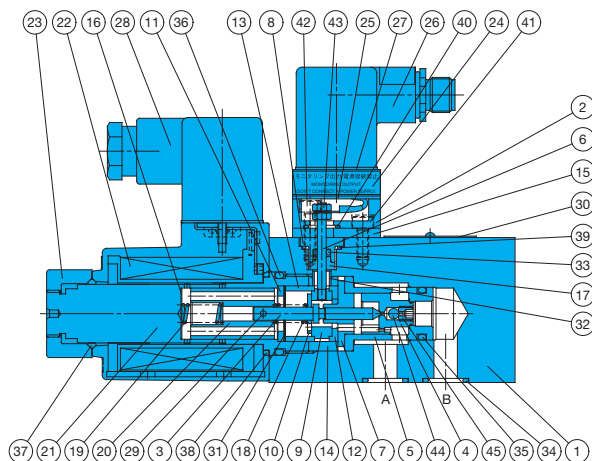
Switching Responsiveness



Type of Machine	Model	Response Time (s)			
		Pressure		Switch	
		T1	T2	T3	T4
DC Solenoid	SCW-G03-AR-GR-D2-J11	0.03 to 0.04	0.02 to 0.03	0.01 to T1	T2 to 0.05
DC Solenoid with Built-in Rectifier	SCW-G03-AR-E1-J11	0.03 to 0.04	0.08 to 0.11	0.01 to T1	T2 to 0.20

Note) May vary depending on switching response time and operating conditions (pressure, flow rate, and oil temperature).

Cross-sectional Drawing



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Spacer (sealing prevention)	31	Wave washer
2	Cover (connector)	17	Collar (insulated)	32	Spacer (ring rotation prevention)
3	Needle Valve	18	Spring (contact side)	33	O-ring *
4	Poppet	19	Spring (guide side)	34	O-ring *
5	Sleeve	20	Solenoid plunger	35	O-ring *
6	Rod (conductor)	21	Solenoid guide	36	O-ring *
7	Bush (needle valve support)	22	Solenoid coil	37	O-ring *
8	Bush (insulated)	23	Nut	38	O-ring *
9	Retainer (fixed contact)	24	Connector with lead wire	39	O-ring *
10	Retainer (movable contact)	25	Packing	40	O-ring *
11	Retainer (flange side)	26	Connector with built-in photo-coupler	41	Hexagon socket head bolt
12	Ring (insulation inside)	27	Connector packing	42	Hexagon socket head bolt
13	Ring (insulation outside)	28	Connector	43	Hexagon nut
14	Ring (fixed by sleeve)	29	Parallel pin	44	Steel ball ★
15	Plate (connector)	30	Nameplate	45	Set screw ★

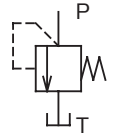
Seal Part List (Kit Model Number EQS-SC)

Part No.	Part Name	Part Number	Q'ty
33	O-ring	NBR-90 P3	1
34	O-ring	AS568-014(NBR-90)	2
35	O-ring	NBR-90 P14	1
36	O-ring	AS568-119(NBR-90)	1
37	O-ring	NBR-70-1 P20	1
38	O-ring	S-25(NBR-70-1)	1
39	O-ring	S-11.2(NBR-90)	1
40	O-ring	S-9(NBR-70-1)	1

Note) 1. For details about parts marked with an asterisk ***, refer to the list of seals in the table on the right.

2. Products marked with a ★ use only SCW-G03-ARC-**-**-J11 and do not use SCWG03-AR-**-**-J11.

Note) NBR are JIS Standard B 2401, while AS568 is SAE standard.



Relief Valve

20 to 380ℓ/min
21MPa

Features

- ① Balanced piston relief valve.
- ② Optimum pressure control for hydraulic circuit allows operation as a safety valve.
- ③ A vent port enables remote control of pressure and use of an unloading circuit.

Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa(kgf/cm ²)	Weight kg	
Screw Mounting	Gasket Mounting					T Type	G Type
R-T03-A-12 B-12	R-G03-A-12 B-12	3/8	21 {214} P, X (Vent Ports)	20	* to 1 { * to 10.2 } * to 2.5 { * to 25.5 }	3.0	4.3
R-T03-1-12 3-12	R-G03-1-12 3-12	3/8		80	* to 7 { * to 71.4 } 3.5 to 21 {35.7 to 214 }	3.0	4.3
R-T06-1-20 3-20	R-G06-1-20 3-20	3/4		170	* to 7 { * to 71.4 } 3.5 to 21 {35.7 to 214 }	3.9	5.3
R-T10-1-20 3-20	R-G10-1-20 3-20	1¼		380	* to 7 { * to 71.4 } 3.5 to 21 {35.7 to 214 }	7.7	7.7

Note) See the Flow Rate - Low Pressure characteristics for information about items marked with an asterisk (*).

● Handling

- ① To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- ② Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}. For tank piping of the A and B type pressure adjusting ranges, return directly to the tank without connecting any other piping and eliminate back pressure.
- ③ The pressure adjustment range for the high vent type is 1.3MPa {13.3kgf/cm²}. Note that R-T/G03 is not a high vent type.
- ④ When using a relief valve as a safety valve, use a pressure override that is higher than the required circuit pressure.
- ⑤ When using a remote control valve, connect piping to the relief valve port. Pipe capacity can be a source of vibration. Use of thick iron pipe with an inside diameter of no more than 4mm and a connection length of no more than three meters is recommended.
- ⑥ Pressure becomes unstable when at slow control flow rates. Use a flow rate of no less than 8 ℓ/min for the 03, 06 sizes, and 10 ℓ/min for the 10 size. Use a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.

⑦ Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MR-03-10	3/8	1.6	R-G03-*-12
MR-06-20	3/4	3.5	R-G06-*-20
MR-06X-20	1		
MR-10-20	1¼	8.5	R-G10-*-20
MR-10X-20	1½		

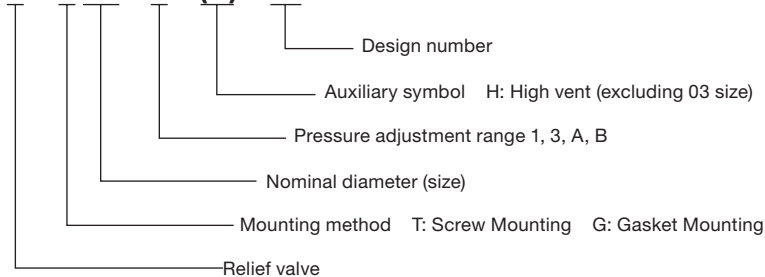
⑧ The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
R-G03-*-12	M10×75ℓ	4	45 to 55 {460 to 560}
R-G06-*-20	M16×80ℓ	4	190 to 235 {1940 to 2400}
R-G10-*-20	M20×105ℓ	4	370 to 460 {3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

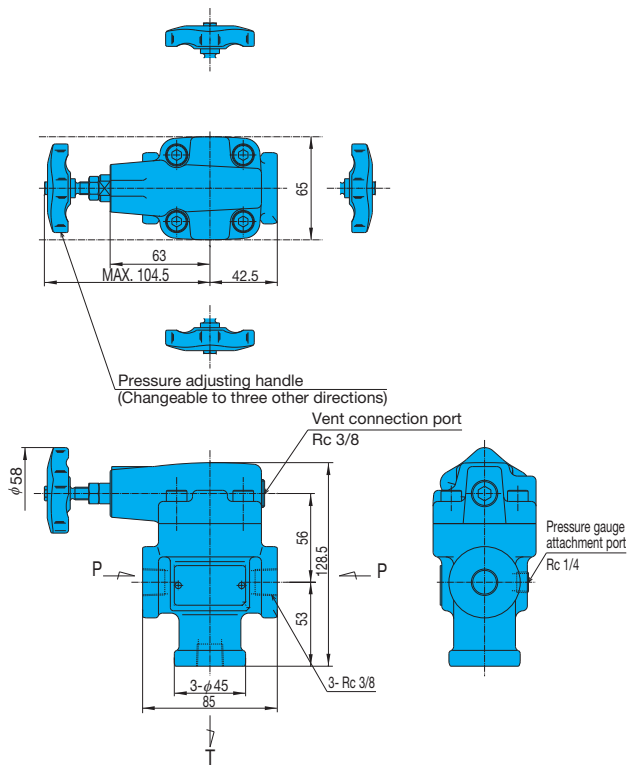
Explanation of model No.

R - T 06 - 1 - (H) - 20

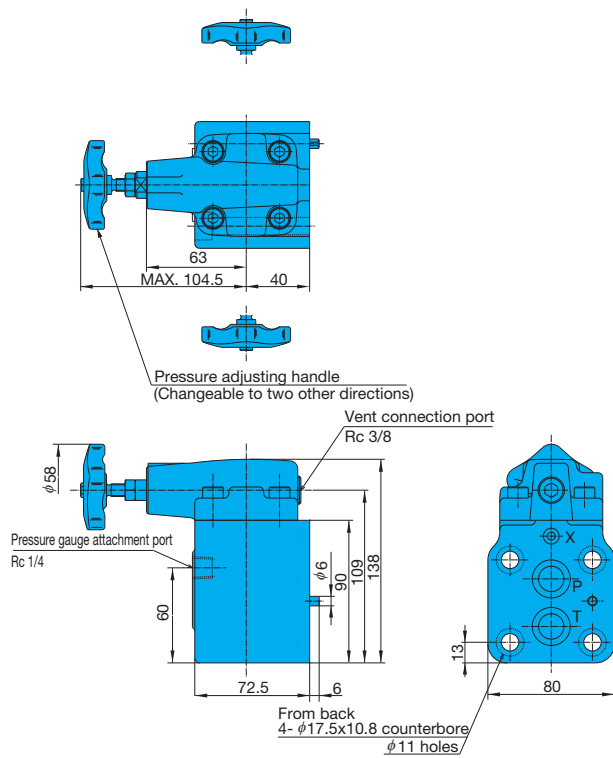


Installation Dimension Drawings

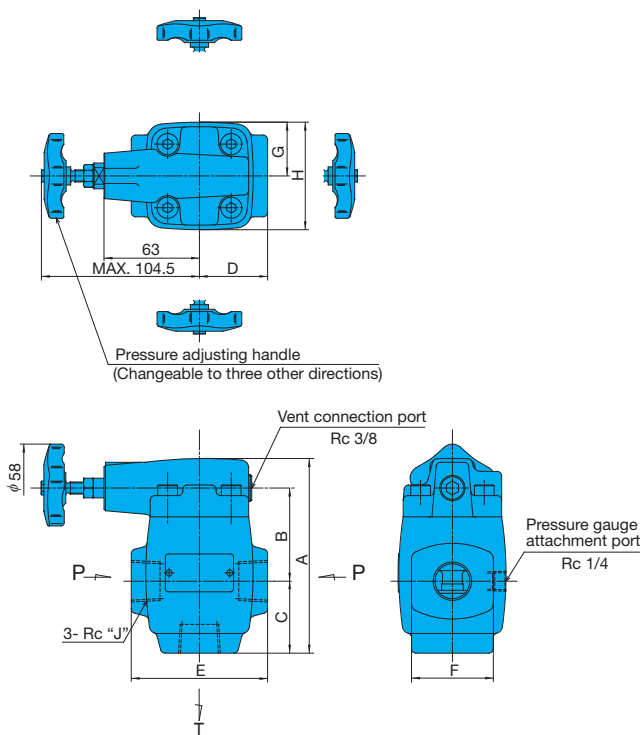
R-T03-*-12 (Screw Mounting)



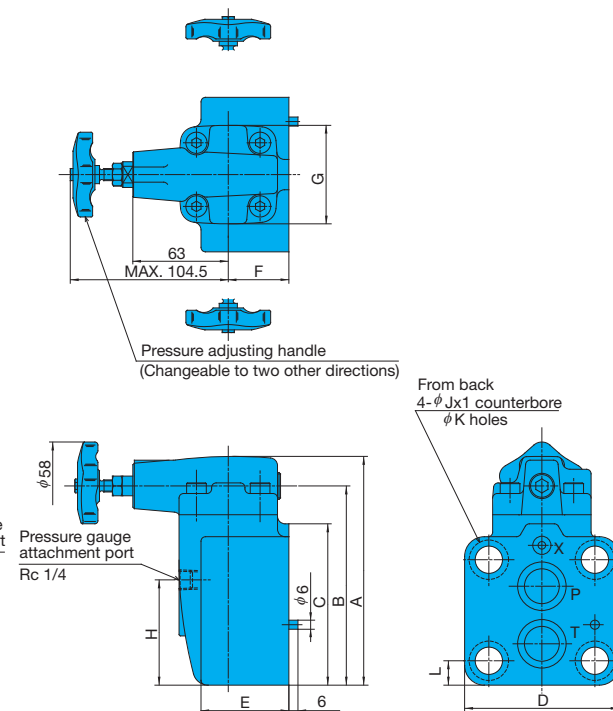
R-G03-*-12 (Gasket Mounting)



R-T**-*-20 (Screw Mounting)



R-G**-*-20 (Gasket Mounting)

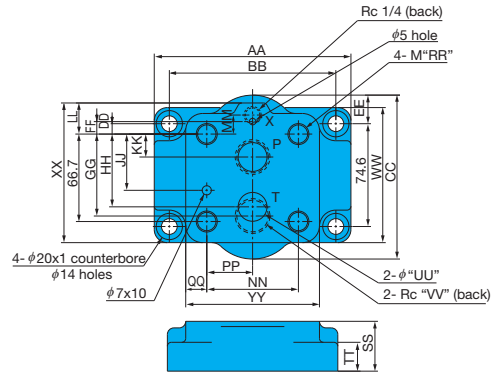
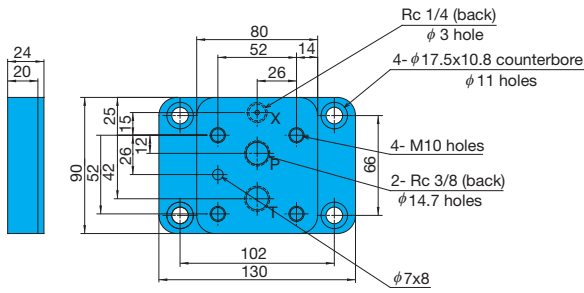


Model No.	A	B	C	D	E	F	G	H	J
R-T06-*-20	128.5	61.5	47.5	45	90	54	35.5	71	3/4
R-T10-*-20	153.5	72	62	62.5	125	69	47	94	1 1/4

Model No.	A	B	C	D	E	F	G	H	J	K	L
R-G06-*-20	151	131.5	106.5	102	58	40	65	69.5	26	18	16.1
R-G10-*-20	162.5	143	110	127	80	50	86	70.5	32	22	17.7

Sub Plate MR-03-10

MR-**-20



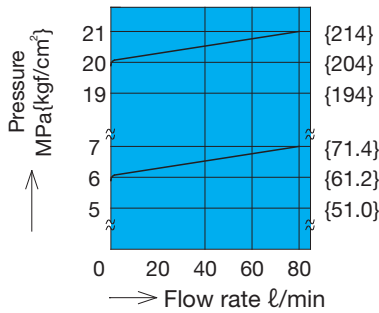
Model No.	Dimensions (mm)																						
	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY
MR-06-20	150	127	125	7.9	21.8	9.5	62.5	55.5	42.9	17.5	23.7	14.5	69.9	34.9	16.1	16	38	22	22	3/4	98.5	106.5	102
MR-06X-20																				1			
MR-10-20	175	152.4	150	6.4	39.2	15.9	71.3	58.7	50.8	14.3	25.6	25.9	92.1	46.1	17.5	20	55	22	28.5	1 1/4	102.5	110	127
MR-10X-20																				1 1/2			

Performance Curves

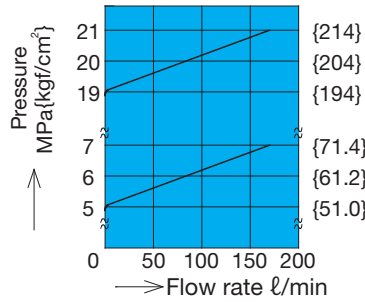
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure - Flow Rate Characteristics

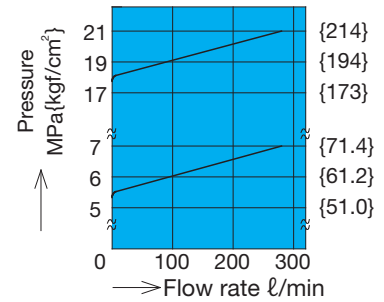
R-*03-**-12



R-*06-**-20

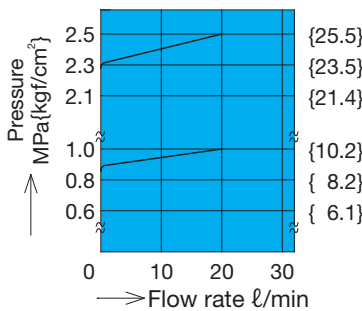


R-*10-**-20

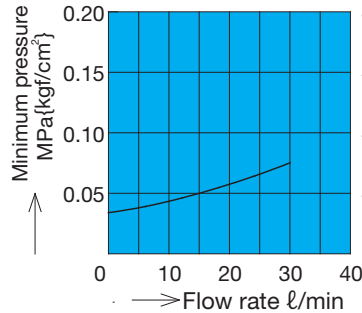


Flow Rate - Minimum Pressure Characteristics

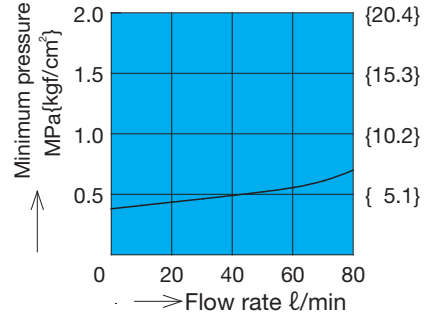
R-*03-^A/_B-12



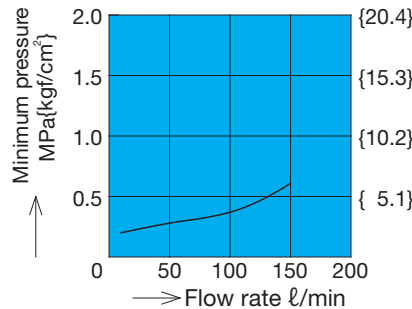
R-*03-^A/_B-12



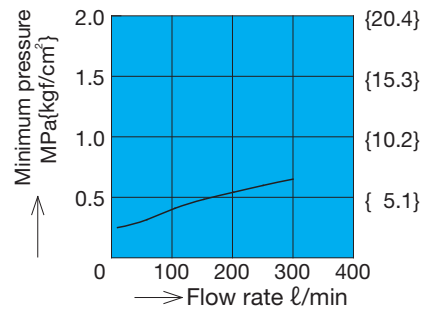
R-*03-1-12



R-*06-1-20



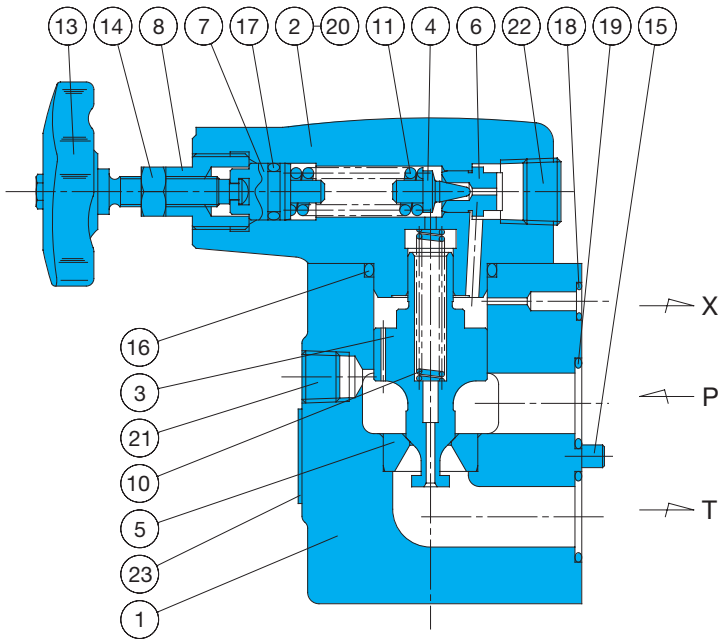
R-*10-1-20



Note) The performance curves do not include T port back pressure.

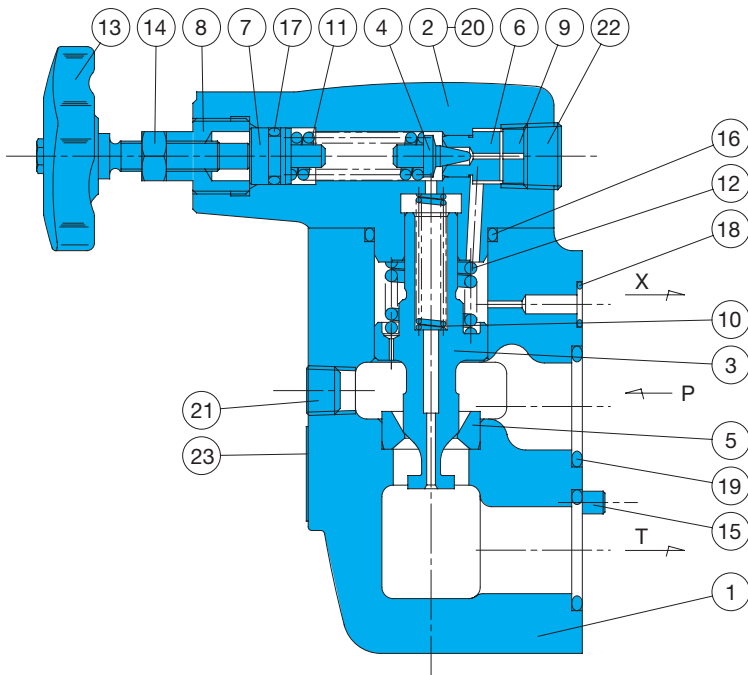
Cross-sectional Drawings

R-G03- $\frac{A}{B}$ -12



R-G03- $\frac{1}{3}$ -12

R-G $\frac{06.1}{10.3}$ -1-20



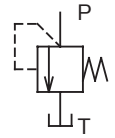
Part No.	Part Name
1	Body
2	Cover
3	Spool
4	Poppet
5	Seat
6	Seat
7	Plunger
8	Retainer
9	Collar
10	Spring
11	Spring
12	Spring
13	Handle
14	Nut
15	Spring pin
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	Screw
21	Plug
22	Plug
23	Nameplate

Note) The No. 12 spring is not included when auxiliary symbol H is selected (except with the 03 size).

Seal Part List (Kit Model Number RRS-*** (03 size)
RRBS-*** (06, 10 size))

Part No.	Part Name	Type/Part Number						Q'ty
		R-G03-*-12	R-T03-*-12	R-G06-*-20	R-T06-*-20	R-G10-*-20	R-T10-*-20	
16	O-ring	NBR-90 G30	NBR-90 G30	NBR-90 G30	NBR-90 G30	NBR-90 G40	NBR-90 G40	1
17	O-ring	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	1
18	O-ring	NBR-90 P7	-	NBR-90 P9	-	NBR-90 P9	-	1
19	O-ring	NBR-90 P20	-	NBR-90 P26	-	NBR-90 G35	-	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.
*** in the kit number is used for specification of the valve size (G03, T06, etc.)



RI Series Relief Valve (ISO Mounting, Balanced Piston Type)

40 to 320ℓ/min
35MPa

Features

- ① High pressure capacity balanced piston relief valve.
- ② Optimum pressure control for hydraulic circuit allows operation as a safety valve.
- ③ A vent port enables remote control of pressure and use of an unloading circuit.
- ④ ISO standard mounting service (see table below).

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa(kgf/cm ²)	Weight kg	Gasket Surface Dimensions
RI-G03-C-20	3/8	35 {357} P, X Ports	40	0.15 to 3.5 {1.5 to 35.7}	4.5	ISO 6264-06-09-0-97
RI-G03-1-20 3 5	3/8		150	0.8 to 7 { 8.2 to 71.4 } 3.5 to 25 {35.7 to 255 } 3.5 to 35 {35.7 to 357 }	4.5	
RI-G06-1-20 3 5	3/4		320	0.8 to 7 { 8.2 to 71.4 } 3.5 to 25 {35.7 to 255 } 3.5 to 35 {35.7 to 357 }	5.6	ISO 6264-08-13-0-97

● Handling

- ① To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- ② Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
- ③ For use as a safety valve, use a pressure override that is higher than the required circuit pressure.
- ④ When using a remote control valve, connect piping to the relief valve port. Pipe capacity can cause vibration. Use of thick iron pipe with an inside diameter of no more than 4mm and a connection length of no more than three meters is recommended.

- ⑤ The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
RI-G03-*-20	M12×50ℓ	4	75 to 95 {765 to 970}
RI-G06-*-20	M16×60ℓ	4	190 to 235 {1940 to 2400}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

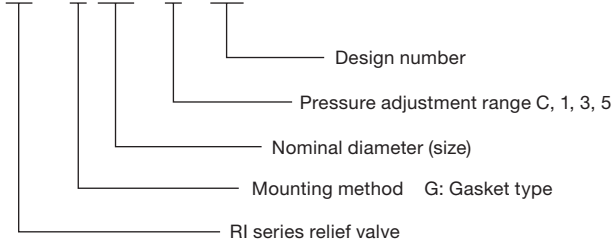
- ⑥ A small control flow rate can cause pressure instability. Use a control flow rate that is at least 8 ℓ/min. Use a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.

- ⑦ Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MRI-03-10	3/8	2.6	RI-G03
MRI-03X-10	1/2		
MRI-06-10	3/4	3.5	RI-G06
MRI-06X-10	1		

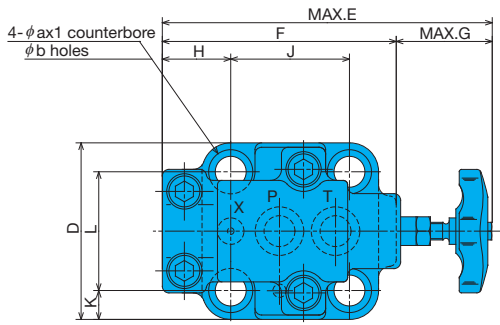
Explanation of model No.

RI - G 06 - 1 - 20

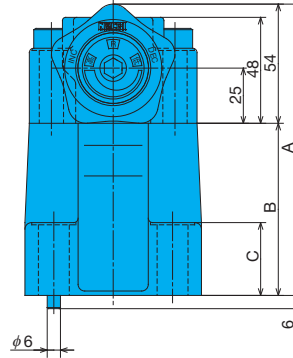
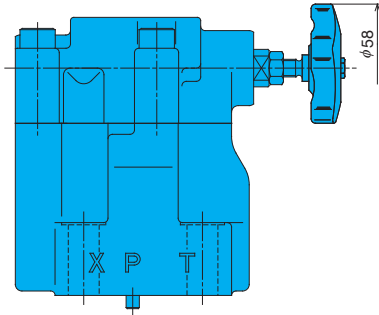


Installation Dimension Drawings

RI-G**-*-20



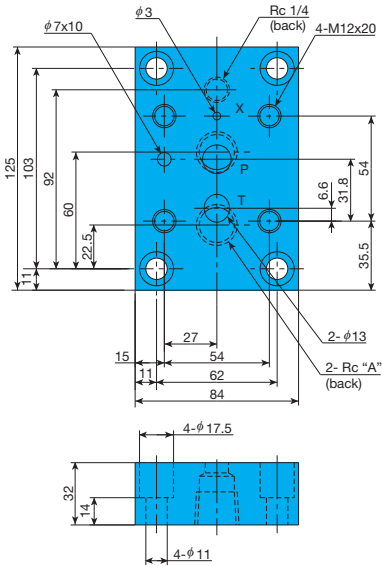
Model No.	A	B	C	D	E	F	G	H	J	K	L	a	b
RI-G03-*-20	132	78	32	80	149.5	106	43.5	31	53.8	13.1	53.8	20	14
RI-G06-*-20	137	83	36	100	158.5	119	39.5	37	66.7	15	70	26	17.5



Pressure Control Valve

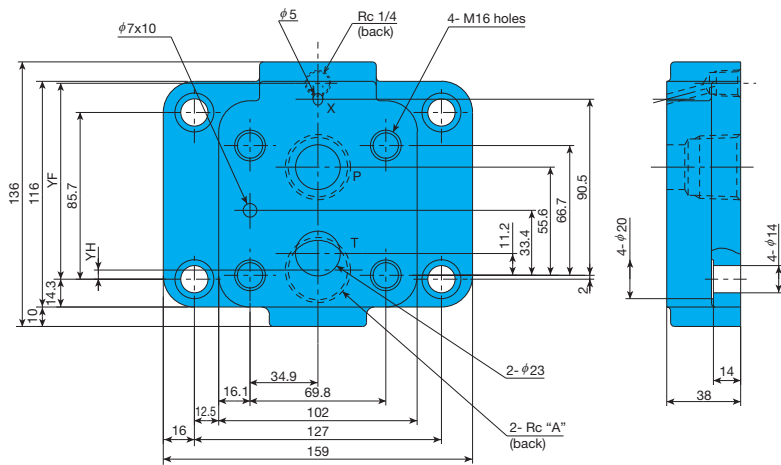
Sub Plate MRI-03*-10

(Maximum Operating Pressure: 25MPa)



Sub Plate MRI-06*-10

(Maximum Operating Pressure: 25MPa)



Attach a plug when the vent (X) port is not used.

Model No.	A
MRI-03-10	3/8
MRI-03X-10	1/2
MRI-06-10	3/4
MRI-06X-10	1

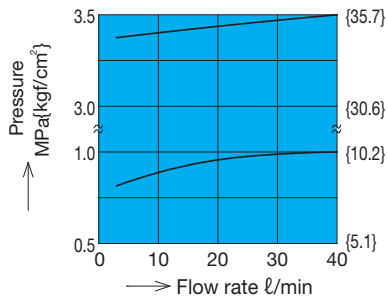
Model No.	YF	YH
MRI-06-10	92.5	13.2
MRI-06X-10	100.7	4.7

Performance Curves

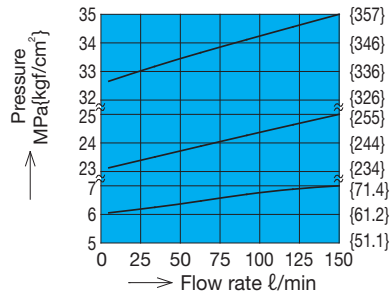
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure - Flow Rate Characteristics

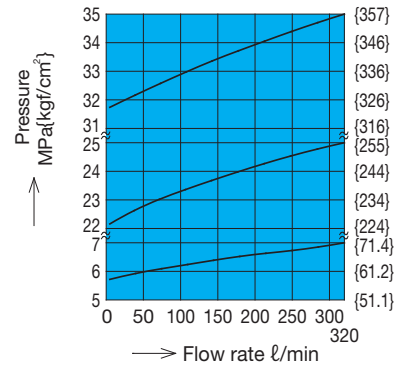
RI-G03-C-20



RI-G03-*-20



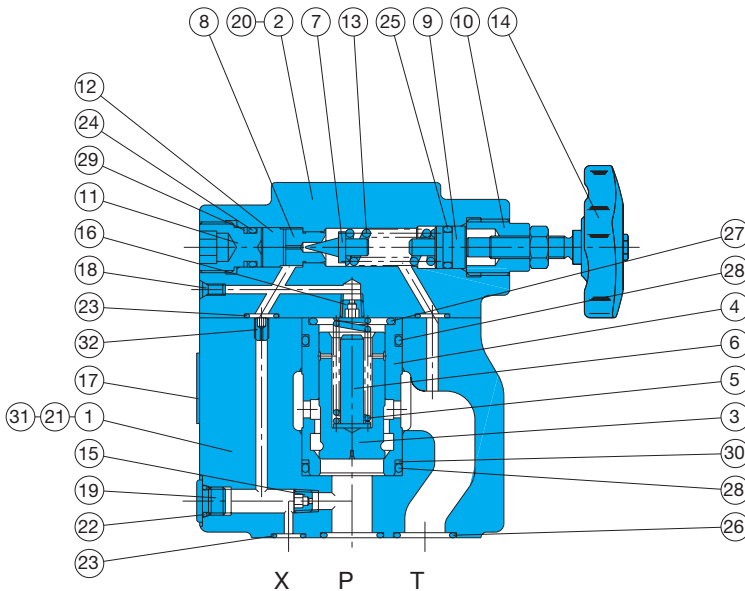
RI-G06-*-20



Note) The performance curves do not include T port back pressure.

Cross-sectional Drawing

RI-G**-*-20



Part No.	Part Name	Part No.	Part Name
1	Body	17	Plate
2	Cover	18	Plug
3	Poppet	19	Plug
4	Sleeve	20	Screw
5	Spring	21	Pin
6	Spacer	22	O-ring
7	Poppet	23	O-ring
8	Seat	24	O-ring
9	Plunger	25	O-ring
10	Retainer	26	O-ring
11	Plug	27	O-ring
12	Collar	28	O-ring
13	Spring	29	Backup ring
14	Handle assy	30	Backup ring
15	Orifice	31	Screw
16	Orifice	32	Choke

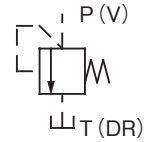
Seal Part List (Kit Model Number REBS-***)

Part No.	Part Name	Nominal Diameter/Part Number		Q'ty
		G03	G06	
22	O-ring	NBR-90 P8	NBR-90 P8	1
23	O-ring	NBR-90 P9	NBR-90 P9	3
24	O-ring	NBR-90 P10A	NBR-90 P10A	1
25	O-ring	NBR-70-1 P11	NBR-70-1 P11	1
26	O-ring	NBR-90 P18	NBR-90 P28	2
27	O-ring	NBR-90 G25	NBR-90 P28	1
28	O-ring	NBR-90 G30	NBR-90 P32	2
29	Backup ring	T2-P10A	T2-P10A	1
30	Backup ring	T2-G30	T2-P32	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
For the *** part of the kit number, specify the valve size (G03, G06).

Remote Control Relief Valve

2 to 15ℓ/min
21MPa



Features

- ① Connecting a relief valve or reducing valve to the vent port of a balanced piston type pressure control valve provides simple remote control of pressure.
- ② RCD type can also be used as a direct type relief valve.

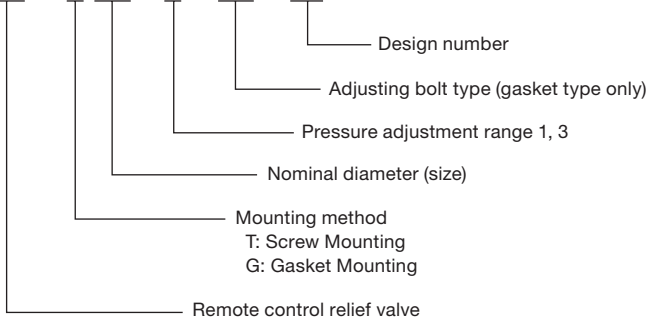
Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm ² }	Weight kg
Screw Mounting	Gasket mounting					
RCD-T02-1-11 3-11	-	1/4	21 {214} P, V ports	15	0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	2.1
RC-T02-1-12 3-12	RC-G02-1-21 3-21					

Note) The pressure adjustment range indicates cracking pressure.

Explanation of model No.

RC - G 02 - 1 - (K) - 21

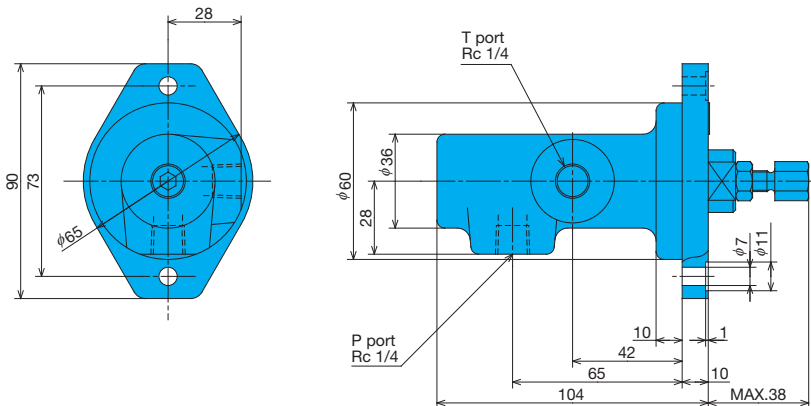


● Handling

- ① To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- ② Make sure that drain port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
- ③ When configuring pipes for the pressure control valve and remote control valve, use of thick iron pipe with an inside diameter of no more than 4mm and a connection length of no more than three meters is recommended. Pipe capacity can be a source of vibration.
- ④ When an adjustment bolt type is required for the pressure adjustment block, insert K for the type specification. See the dimension drawings, RC-G02 only.
- ⑤ Use the following to specify a sub plate.

Installation Dimension Drawings

RCD-T02-*-11 (Screw Mounting)



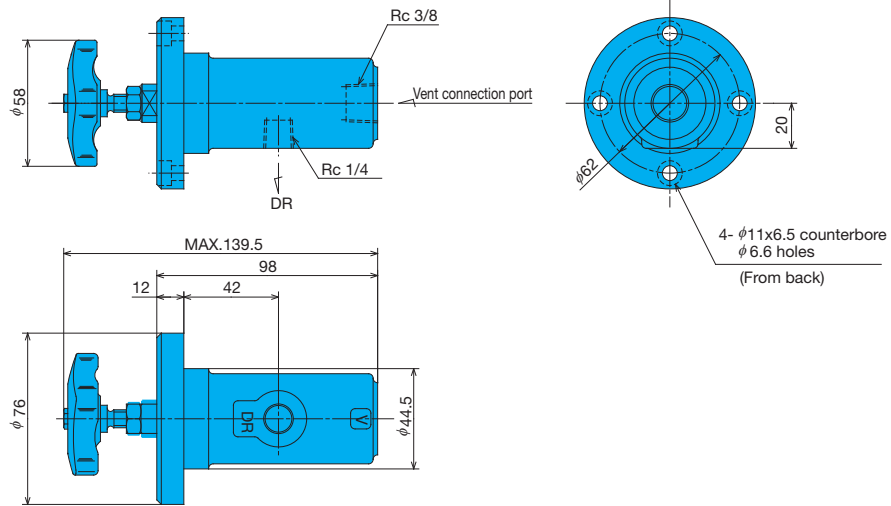
Model No.	Weight kg
MRC-02-20	1.0

- ⑥ The following are the bundled mounting bolts.

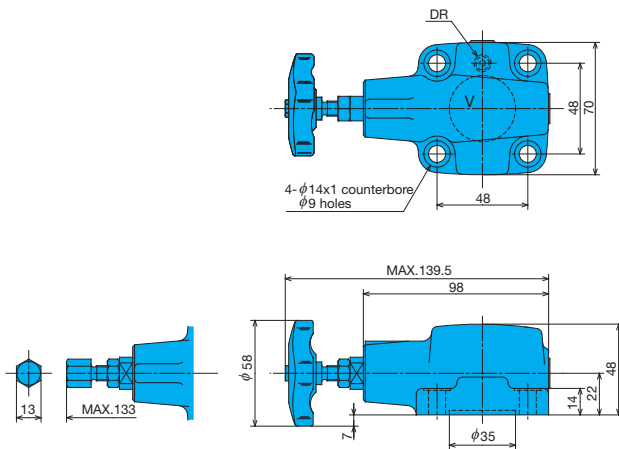
Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
RC-G02-*-21	M8×25ℓ	4	20 to 25 {205 to 255}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

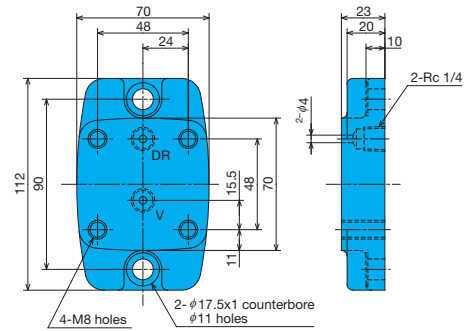
RC-T02-*-12 (Screw Mounting)



RC-G02-*-21 (Gasket Mounting)

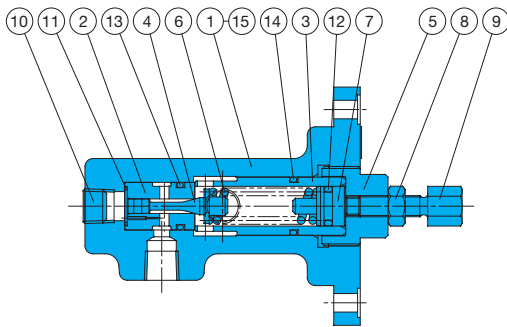


Sub Plate MRC-02-20



Cross-sectional Drawings

RCD-T02-*-11



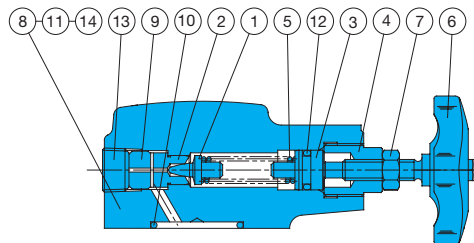
Part No.	Part Name	Part No.	Part Name
1	Body	12	O-ring
2	Sleeve	13	O-ring
3	Sleeve	14	O-ring
4	Poppet	15	Nameplate
5	Retainer		
6	Spring		
7	Guide		
8	Nut		
9	Screw		
10	Plug		
11	O-ring		

Seal Part List (Kit Model Number RCS-T02CD)

Part No.	Part Name	Part Number	Q'ty
11	O-ring	S12.5(NBR-70-1)	1
12	O-ring	NBR-70-1 P11	1
13	O-ring	NBR-90 P14	1
14	O-ring	NBR-90 P18	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

RC-G02-*- (K)-21



Seal Part List (Kit Model Number RCBS-G02)

Part No.	Part Name	Part Number	Q'ty
10	O-ring	NBR-90 G30	1
11	O-ring	NBR-90 P6	1
12	O-ring	NBR-70-1 P11	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Part No.	Part Name
1	Poppet
2	Seat
3	Plunger
4	Retainer
5	Spring
6	Handle
7	Nut
8	Cover
9	Collar
10	O-ring
11	O-ring
12	O-ring
13	Plug
14	Plate



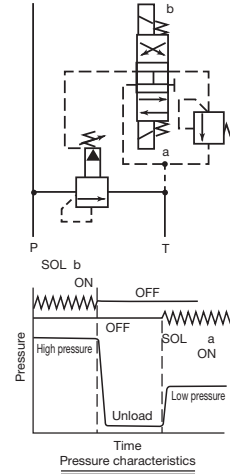
Solenoid Controlled Relief Valve

30 to 380ℓ/min
21MPa

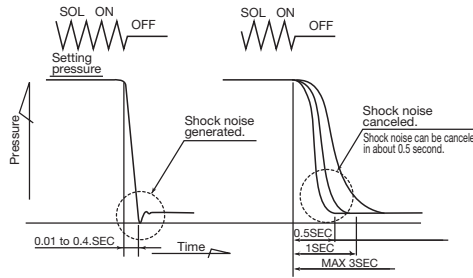
Features

- This valve adds a wet type solenoid valve to a balanced type piston type relief valve to form a hydraulic device unload circuit.
- The shockless type has an internal structure that prevents shock generated during unloading. This valve can also be used in a pressure relief circuit, and has a maximum adjustment time of three seconds. See the pressure relief circuit example.
- A two-pressure control circuit can be configured by adding a relief modular valve. Contact your agent for more information.

(Two-pressure Control Circuit Example)



(Pressure Relief Circuit Example)



Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa(kgf/cm ²)	Weight kg		JIS Symbol	Used Solenoid Valve Model Number
Screw Mounting	Gasket Mounting					T Type	G Type		
RSS (RSA) -T03-AQ ₃ ¹ -**-15	RSS (RSA) -G03-AQ ₃ ¹ -**-15	3/8	21 {214}	80	Type 1 0.8 to 7 {8.2 to 71.4}	3.2	4.5		SS (SA) -G01-A3X ¹ -**-31
RSS (RSA) -T06-AQ ₃ ¹ -**-23	RSS (RSA) -G06-AQ ₃ ¹ -**-23	3/4		170		4.0	6.4		
RSS (RSA) -T10-AQ ₃ ¹ -**-23	RSS (RSA) -G10-AQ ₃ ¹ -**-23	1 1/4		380		8.8	10.0		
RSS (RSA) -T03-AR ₃ ¹ -**-15	RSS (RSA) -G03-AR ₃ ¹ -**-15	3/8	21 {214}	80	Type 3 3.5 to 21 {35.7 to 214}	3.2	4.5		SS (SA) -G01-AR ¹ -**-31
RSS (RSA) -T06-AR ₃ ¹ -**-23	RSS (RSA) -G06-AR ₃ ¹ -**-23	3/4		170		4.0	6.4		
RSS (RSA) -T10-AR ₃ ¹ -**-23	RSS (RSA) -G10-AR ₃ ¹ -**-23	1 1/4		380		8.8	10.0		

Shockless Type

RSS (RSA) -T03- ₃ ¹ -F ¹ -**-15	RSS (RSA) -G03- ₃ ¹ -F ¹ -**-15	3/8	21 {214}	80	Type 1 1 to 7 {10.2 to 71.4}	4.2	5.5		SS (SA) -G01-A8X0 ¹ -**-31
RSS (RSA) -T06- ₃ ¹ -F ¹ -**-23	RSS (RSA) -G06- ₃ ¹ -F ¹ -**-23	3/4		170		5.0	7.4		
RSS (RSA) -T10- ₃ ¹ -F ¹ -**-23	RSS (RSA) -G10- ₃ ¹ -F ¹ -**-23	1 1/4		380		9.8	12.0		

Note) For information about electrical specifications, see the SS type and SA type solenoid valve items on pages E-1 and E-13.

● Handling

- To adjust pressure, loosen the lock nut and then rotate the adjusting bolt clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- To adjust the time from onload to unload, loosen the lock nut and rotate the restrictor adjusting bolt clockwise (rightward) to make the time longer, or counterclockwise (leftward) to make it shorter.
- Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
- The ** before the design number in the model number of the solenoid valve used shows voltage. See the voltage symbols in the model number explanation.
- Pressure becomes unstable when at slow control flow rates. Use a flow rate of no less than 8 ℓ/min for the 03, 06 sizes, and 10 ℓ/min for the 10 size.
- Use 90 to 110% of rated voltage.
- The pressure adjustment range for the high vent type is 1.3MPa {13.3kgf/cm²}. Note that RSS (RSA) -T/G03 is not a high vent type.
- Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Weight kg	Applicable Valve Type
MR-03-10	3/8	1.6	RSS (RSA) -G03-***-**-15
MR-06-20	3/4	3.5	RSS (RSA) -G06-***-**-23
MR-06X-20	1		
MR-10-20	1 1/4	8.5	RSS (RSA) -G10-***-**-23
MR-10X-20	1 1/2		

Note) See page relief valve page item on F-3 for dimensions.

- The following are the bundled mounting bolts.

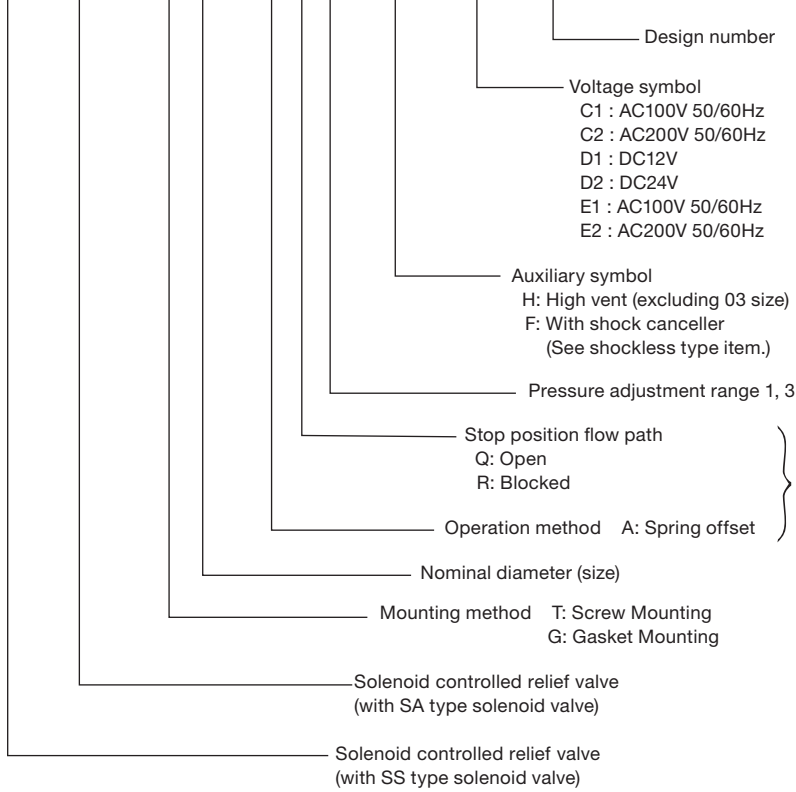
Model No.	Bolt Dimensions	Qty	Tightening Torque N·m(kgf·cm)
RSS (RSA) -G03-***-**-15	M10×75ℓ	4	45 to 55 {460 to 560}
RSS (RSA) -G06-***-**-23	M16×80ℓ	4	190 to 235 {1940 to 2400}
RSS (RSA) -G10-***-**-23	M20×105ℓ	4	370 to 460 {3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

- The coil surface temperature increases if this pump is kept continuously energized. Install the valve so there is not chance of it being touched directly by hand.

Explanation of model No.

RSS(RSA) - G 06 - A Q 1 - (H) - C1 - 23



Other auxiliary symbols can be used
 (enter them in alphabetic order if there are 2 or more).

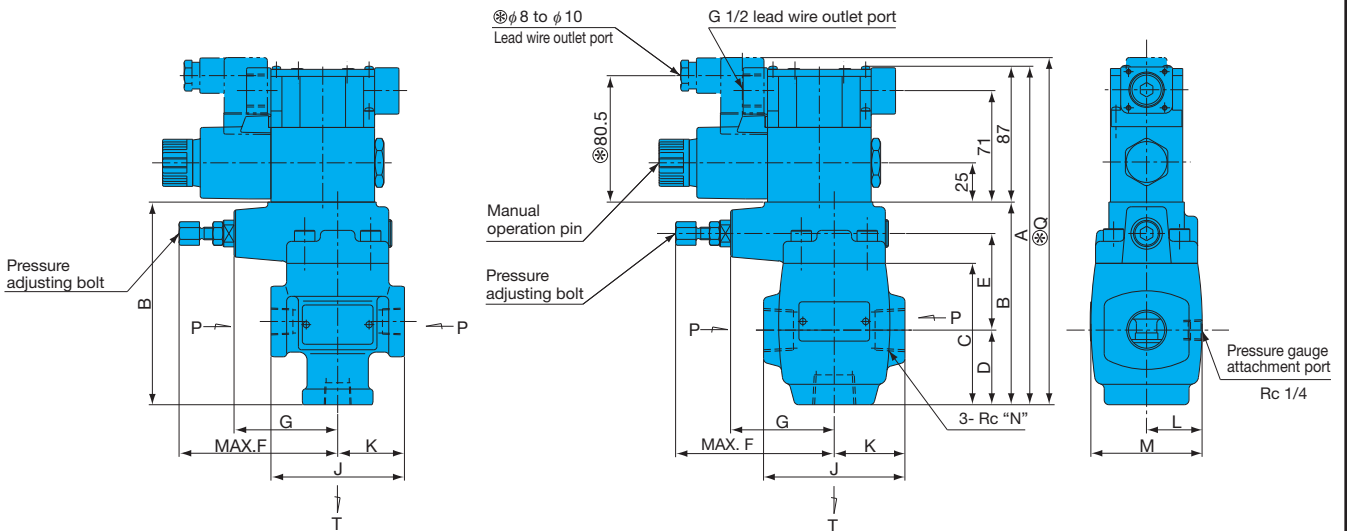
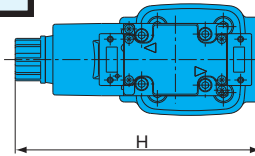
With SS type solenoid valve	G, N, Q (R is omitted).
With SA type solenoid valve	GR, J, N, Q, R

Not required with the shockless type.

Installation Dimension Drawings

RSS -T**-A**-**-15, 23
 (RSA)

Note) Dimensions marked with Ⓢ are for the RSA type.
 Note) Dimensions in parentheses apply in the case of a DC solenoid valve.



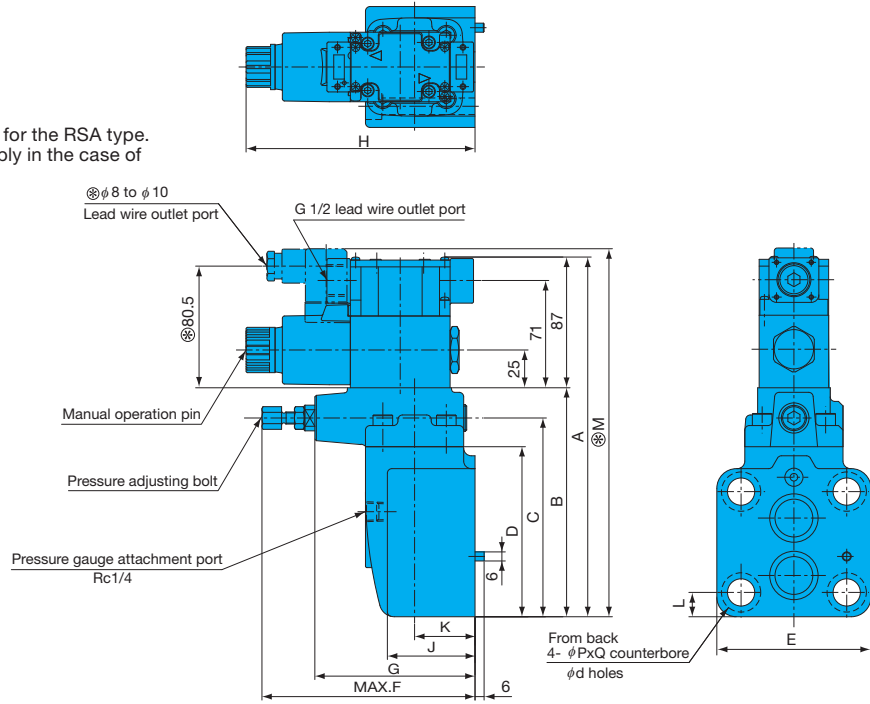
RSS (RSA) -T03-A**-**-15

RSS (RSA) -T⁰⁶₁₀-A**-**-23

Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Q
RSS (RSA) -T03-A**-**-15	214.5	129	90	53	56	101	66	154 (161)	85	42.5	32.5	65	3/8	221.5
RSS (RSA) -T06-A**-**-23	214.5	129	90	47.5	61.5	101	66	156.5 (163.5)	90	45	35.5	71	3/4	221.5
RSS (RSA) -T10-A**-**-23	239	153.5	111.5	62	72	98	63	164.5 (171.5)	125	62.5	47	94	1 1/4	246

RSS
(RSA) -G**-A**-**-15, 23

Note) Dimensions marked with Ⓢ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.

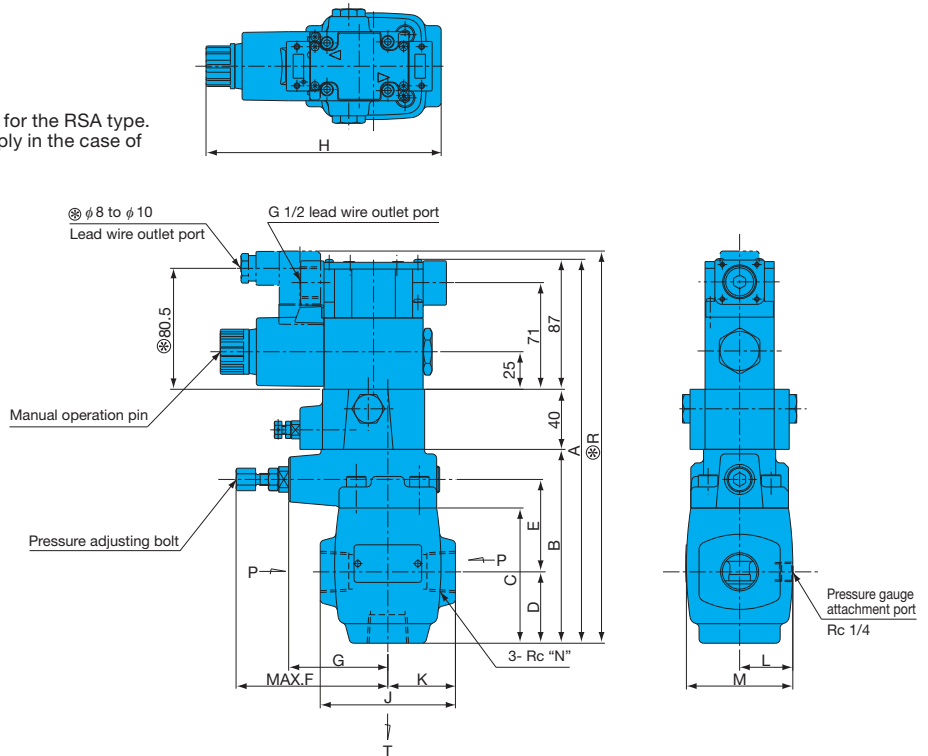


Model No.	A	B	C	D	E	F	G	H	J	K	L	P	Q	d	M
RSS (RSA) -G03-A**-**-15	214.5	129	109	90	80	141	106	150.5 (157.5)	72.5	40	13	17.5	10.8	11	221.5
RSS (RSA) -G06-A**-**-23	237	151.5	131.5	112.5	102	141	106	151.5 (158.5)	58	40	16.1	26	1	18	244
RSS (RSA) -G10-A**-**-23	248	162.5	143	120.5	127	148	113	152 (159)	80	50	17.7	32	1	22	255

Note) For gasket surface dimensions, see R-G**-* 12/20.

RSS
(RSA) -T**-*-F**-15, 23

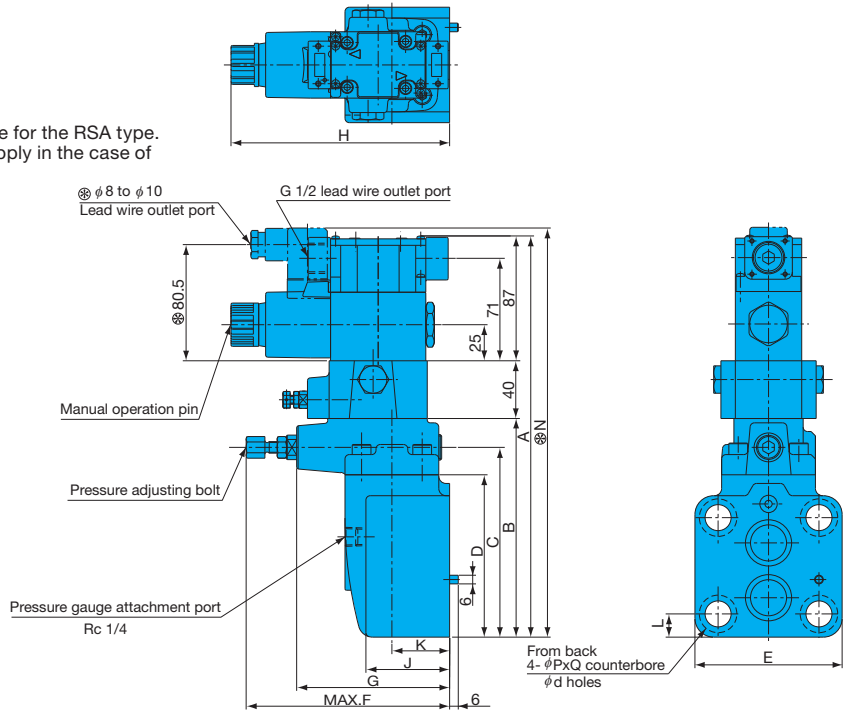
Note) Dimensions marked with Ⓢ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.



Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Q	R
RSS (RSA) -T03-*-F**-15	254.5	129	90	53	56	101	66	154 (161)	85	42.5	32.5	65	32	3/8	261.5
RSS (RSA) -T06-*-F**-23	254.5	129	90	47.5	61.5	101	66	156.5 (163.5)	90	45	35.5	71	33	3/4	261.5
RSS (RSA) -T10-*-F**-23	279	153.5	111.5	62	72	98	63	164.5 (171.5)	125	62.5	47	94	32.5	1 1/4	286

RSS
(RSA) -G**-*-F**-15, 23

Note) Dimensions marked with Ⓢ are for the RSA type.
Note) Dimensions in parentheses apply in the case of a DC solenoid valve.

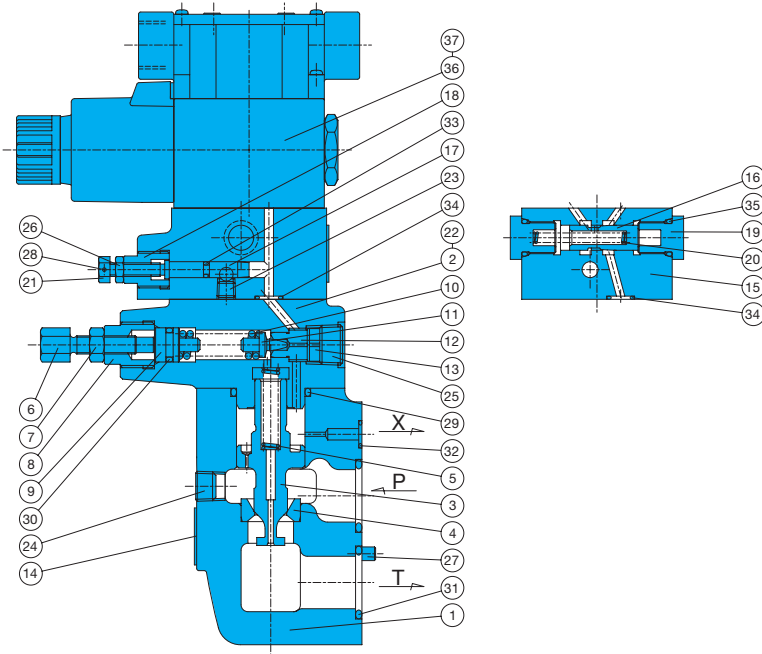


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	d
RSS (RSA) -G03-*-F**-15	254.5	129	109	90	80	141	106	150.5 (157.5)	72.5	40	13	32	261.5	17.5	10.8	11
RSS (RSA) -G06-*-F**-23	277	151.5	131.5	112.5	102	141	106	151.5 (158.5)	58	40	16.1	33	284	26	1	18
RSS (RSA) -G10-*-F**-23	288	162.5	143	120.5	127	148	113	152 (159)	80	50	17.7	32.5	295	32	1	22

Note) For gasket surface dimensions, see R-G**-* 12/20.

Cross-sectional Drawing

RSS-G**-*-F**-15, 23



Part No.	Part Name	Part No.	Part Name
1	Body	20	Spring
2	Cover	21	Nut
3	Spool	22	Screw
4	Seat	23	Plug
5	Spring	24	Plug
6	Screw	25	Plug
7	Nut	26	Nut
8	Retainer	27	Spring pin
9	Plunger	28	Spring pin
10	Spring	29	O-ring
11	Poppet	30	O-ring
12	Seat	31	O-ring
13	Collar	32	O-ring
14	Nameplate	33	O-ring
15	Body	34	O-ring
16	Spool	35	O-ring
17	Throttle	36	Solenoid Valves
18	Retainer	37	Screw
19	Spring guide		

Seal Parts List (Kit Model Number RSBS-***F)

Part No.	Part Name	Type/Part Number			Q'ty
		RSS-G03-*F**-15	RSS-G06-*F**-23	RSS-G10-*F**-23	
29	O-ring	NBR-90 G30	NBR-90 G30	NBR-90 G40	1
30	O-ring	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	1
31	O-ring	NBR-90 P20	NBR-90 P26	NBR-90 G35	2
32	O-ring	NBR-90 P7	NBR-90 P9	NBR-90 P9	1
33	O-ring	NBR-90 P4	NBR-90 P4	NBR-90 P4	1
34	O-ring	NBR-90 P9	NBR-90 P9	NBR-90 P9	2
35	O-ring	NBR-90 P12.5	NBR-90 P12.5	NBR-90 P12.5	2

- Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
 2. For the *** part of the kit number, specify the valve size (G03, G06, G10).
 3. SS (SA)-G01 pilot valve seal is available separately. For details, see pages E-11(E-23).





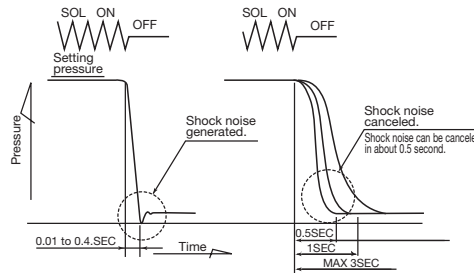
RI Series Solenoid Controlled Relief Valve

150 to 320ℓ/min
35MPa

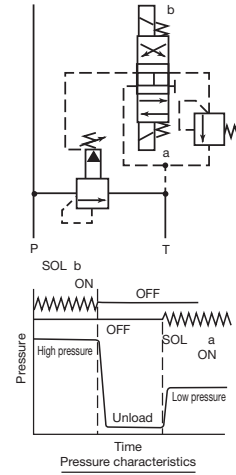
Features

- This valve adds a wet type solenoid valve to a balanced type piston type relief valve to form a hydraulic device unload circuit.
- The shockless type has an internal structure that prevents shock generated during unloading. This valve can also be used in a pressure relief circuit, and has a maximum adjustment time of three seconds. See the pressure relief circuit example.
- A two-pressure control circuit can be configured by adding a relief modular valve. Contact your agent for more information.

(Pressure Relief Circuit Example)



(Two-pressure Control Circuit Example)



Specifications

Model No.	Nominal Diameter (Size)	Maximum Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Pressure adjustment range MPa(kgf/cm ²)	Weight kg	Gasket Surface Dimensions	JIS Symbol	Used Solenoid Valve Model Number
RIS-G03-AQ3-**-21 5	3/8	150	35 {357} P, X Ports	Type 1 0.8 to 7 {8.2 to 71.4} Type 3 3.5 to 25 {35.7 to 255} Type 5 3.5 to 35 {35.7 to 357}	6.0	ISO 6264-06-09-0-97		SS-G01-A3X-**-31
RIS-G06-AQ3-**-21 5	3/4	320			7.1	ISO 6264-08-13-0-97		
RIS-G03-AR3-**-21 5	3/8	150			6.0	ISO 6264-06-09-0-97		SS-G01-AR-**-31
RIS-G06-AR3-**-21 5	3/4	320			7.1	ISO 6264-08-13-0-97		

Shockless Type

RIS-G03-3-F-**-21 5	3/8	150	35 {357} P, X Ports	Type 1 1 to 7 {10.2 to 71.4}	7.0	ISO 6264-06-09-0-97		SS-G01-A3X-**-31
RIS-G06-3-F-**-21 5	3/4	320		Type 3 3.5 to 25 {35.7 to 255}	8.1	ISO 6264-08-13-0-97		

Note) For electrical specifications, see the SS type solenoid valve item on page E-1.

● Handling

- To adjust pressure, loosen the lock nut and then rotate the handle clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- To adjust the time from onload to unload, loosen the lock nut and rotate the restrictor adjusting bolt clockwise (rightward) to make the time longer, or counterclockwise (leftward) to make it shorter.
- Make sure that tank port back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
- The ** before the design number in the model number of the solenoid valve used shows voltage. See the voltage symbols in the model number explanation.

- A small control flow rate can cause pressure instability. Use a control flow rate that is at least 8ℓ/min. Use a drain type relief valve in the case of a flow rate that is less than the minimum flow rate.
- Use 90 to 110% of rated voltage.
- Use the following table for specification when a sub plate is required. Maximum operating pressure is 25MPa {255kgf/cm²}.

Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MRI-03-10	3/8	2.6	RIS-G03
MRI-03X-10	1/2		
MRI-06-10	3/4	3.5	RIS-G06
MRI-06X-10	1		

- The following are the bundled mounting bolts.

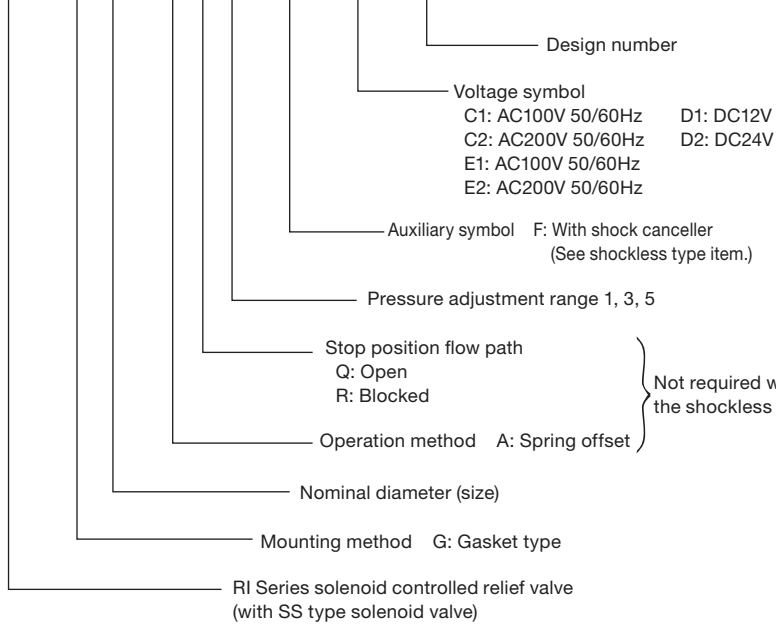
Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
RIS-G03-**-**-21	M12×50ℓ	4	75 to 95 {765 to 969}
RIS-G06-**-**-21	M16×60ℓ	4	190 to 235 {1940 to 2400}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

- The coil surface temperature increases if this pump is kept continuously energized. Install the valve so there is not chance of it being touched directly by hand.

Explanation of model No.

RIS - G 06 - A Q 1 - (F) - C1 - 21

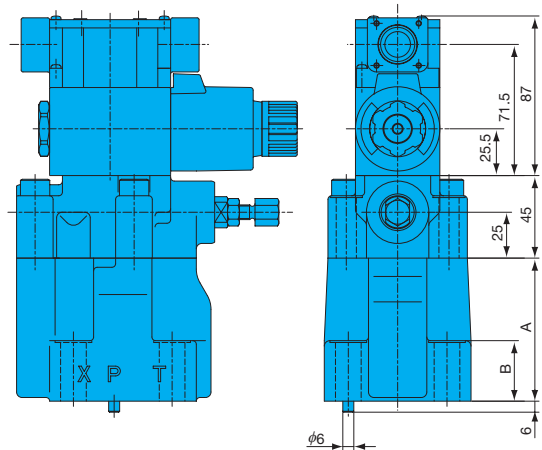
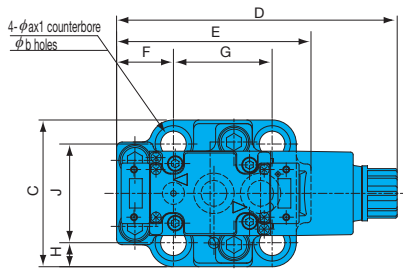


Other auxiliary symbols G, N, and Q (R is omitted) can be used (enter them in alphabetic order if there are 2 or more).

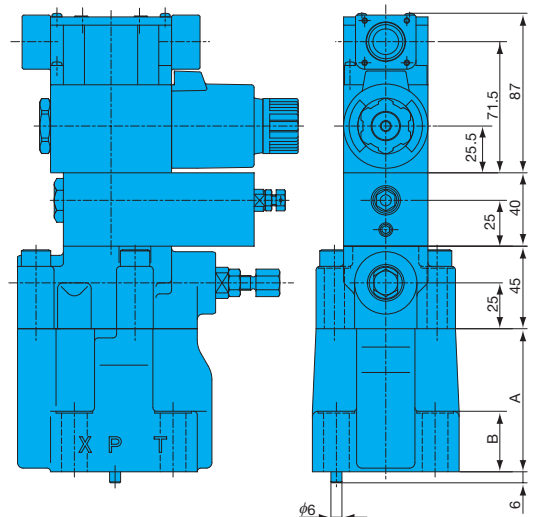
Not required with the shockless type.

Installation Dimension Drawings

RIS-G**-A**-**-21



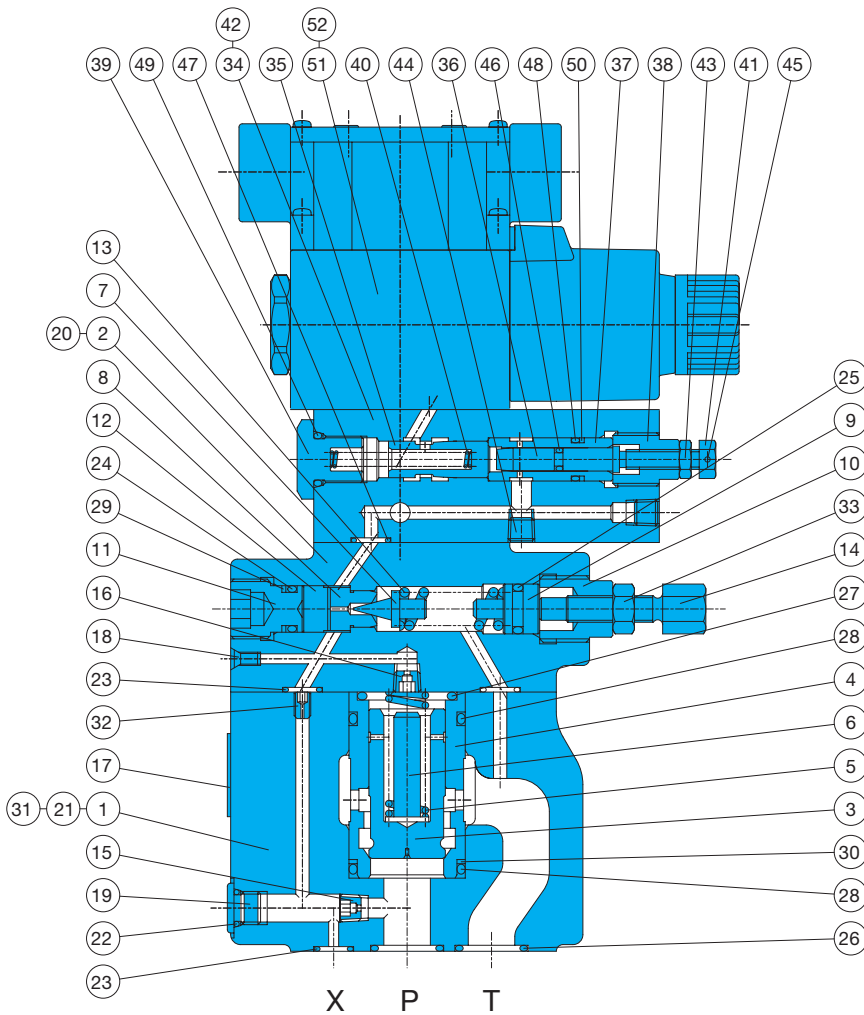
RIS-G**-F**-**-21



Model No.	A	B	C	D	E	F	G	H	J	a	b
RIS-G03-**-**-21	78	32	80	153 (160)	106	31	53.8	13.1	53.8	20	14
RIS-G06-**-**-21	83	36	100	162 (169)	119	37	66.7	15	70	26	17.5

Note) 1. For gasket surface dimensions, see RI-G**-** on page F-5.
 2. Figures in (parenthesis) are for the DC solenoid valve.

Cross-sectional Drawing



Part No.	Part Name
1	Body
2	Cover
3	Poppet
4	Sleeve
5	Spring
6	Spacer
7	Poppet
8	Seat
9	Plunger
10	Retainer
11	Plug
12	Collar
13	Spring
14	Handle assy
15	Orifice
16	Orifice
17	Plate

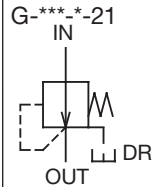
Part No.	Part Name
18	Plug
19	Plug
20	Screw
21	Pin
22	O-ring
23	O-ring
24	O-ring
25	O-ring
26	O-ring
27	O-ring
28	O-ring
29	Backup ring
30	Backup ring
31	Screw
32	Choke
33	Nut
34	Body

Part No.	Part Name
35	Spool
36	Throttle
37	Sleeve
38	Retainer
39	Guide
40	Spring
41	Nut
42	Plate
43	Nut
44	Plug
45	Pin
46	O-ring
47	O-ring
48	O-ring
49	O-ring
50	Backup ring
51	Solenoid Valves
52	Screw

Seal Part List (Kit Model Numbers: Main REBS-***, Restrictor Valve DFS-01H)

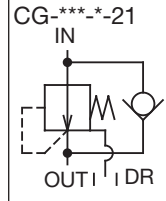
Component Parts	Part No.	Part Name	Nominal Diameter/Part Number		Q'ty
			G03	G06	
Main	22	O-ring	NBR-90 P8	NBR-90 P8	1
	23	O-ring	NBR-90 P9	NBR-90 P9	3
	24	O-ring	NBR-90 P10A	NBR-90 P10A	1
	25	O-ring	NBR-70-1 P11	NBR-70-1 P11	1
	26	O-ring	NBR-90 P18	NBR-90 P28	2
	27	O-ring	NBR-90 G25	NBR-90 P28	1
	28	O-ring	NBR-90 G30	NBR-90 P32	2
	29	Backup ring	T2-P10A	T2-P10A	1
	30	Backup ring	T2-G30	T2-P32	1
	Restrictor Valve	46	O-ring	NBR-90 P4	
47		O-ring	NBR-90 P9		2
48		O-ring	NBR-90 P10		1
49		O-ring	NBR-90 P12.5		1
50		Backup ring	T2-P10		1

- Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
 2. For the *** part of the kit number, specify the valve size (G03, G06).
 3. The restrictor valve kit is required only when a shockless valve is included.
 4. SS (SA)-G01 pilot valve seal is available separately. For details, see pages E-11 (E-23).



Pressure Reducing (and Check) Valve

20 to 280ℓ/min
21MPa



Features

- ① This valve is used when part of the circuit uses pressure that is lower than the main circuit.
- ② Even when pressure changes in the primary main circuit, the reduced secondary pressure is adjusted automatically and maintained at a constant level.
- ③ Connecting a remote control valve to the vent port allows remote control of adjustment pressure.

- ④ The mounting surface of the gasket conforms to the ISO standards shown in the table below.

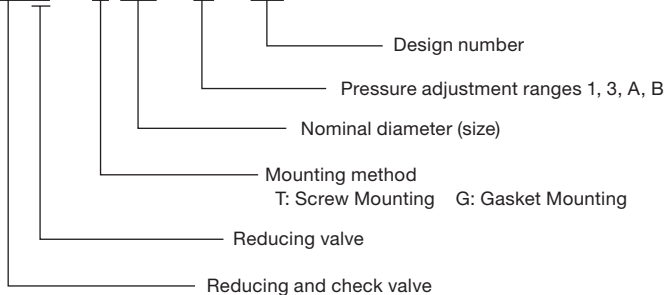
Specifications

Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa(kgf/cm ²)	Weight kg		Gasket Surface Dimensions
Screw Mounting	Gasket Mounting					T Type	G Type	
(C) G-T03-A-21 B-21	(C) G-G03-A-21 B-21	3/8	21 {214} IN, OUT, Vent Port	20	0.25 to 1 {2.6 to 10.2} 0.3 to 2.5 {3.1 to 25.5}	3.3 (3.6)	3.9 (4.2)	ISO 5781-06-07-0-00
(C) G-T03-1-21 3-21	(C) G-G03-1-21 3-21	3/8		50	0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	3.3 (3.6)	3.9 (4.2)	
(C) G-T06-1-21 3-21	(C) G-G06-1-21 3-21	3/4		120	0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	5.7 (6.1)	6.2 (6.6)	ISO 5781-08-10-0-00
(C) G-T10-1-21 3-21	(C) G-G10-1-21 3-21	1¼		280	0.8 to 7 { 8.2 to 71.4 } 3.5 to 21 {35.7 to 214 }	10.0 (11.3)	11.8 (13.1)	ISO 5781-10-13-0-00

Weight values in parentheses are for when a check valve is included. The cracking pressure of the check valve is 0.1MPa{1.0kgf/cm²}

Explanation of model No.

(C)G - T 03 - 1 - 21



● Handling

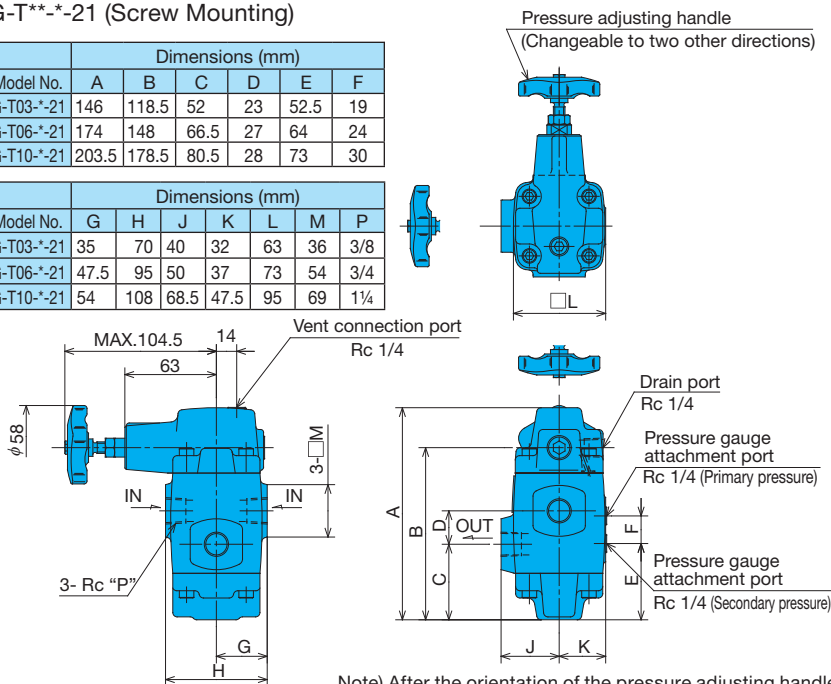
- ① Provide an independent drain pipe directly to the tank.
- ② When using a remote control valve, connect piping to the reducing valve vent port. Pipe capacity can be a source of vibration. Use of thick iron pipe with an inside diameter of no more than 4mm and a connection length of no more than three meters is recommended.
- ③ Use the following table for specification when a sub plate is required.

Installation Dimension Drawings

G-T**-*-21 (Screw Mounting)

Model No.	Dimensions (mm)					
	A	B	C	D	E	F
G-T03-*-21	146	118.5	52	23	52.5	19
G-T06-*-21	174	148	66.5	27	64	24
G-T10-*-21	203.5	178.5	80.5	28	73	30

Model No.	Dimensions (mm)						
	G	H	J	K	L	M	P
G-T03-*-21	35	70	40	32	63	36	3/8
G-T06-*-21	47.5	95	50	37	73	54	3/4
G-T10-*-21	54	108	68.5	47.5	95	69	1¼



Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MG-03-20	3/8	1.6	(C) G-G03-*-21
MG-03X-20	1/2		
MG-06-20	3/4	3.9	(C) G-G06-*-21
MG-06X-20	1		
MG-10-20	1¼	6.7	(C) G-G10-*-21
MG-10X-20	1½		

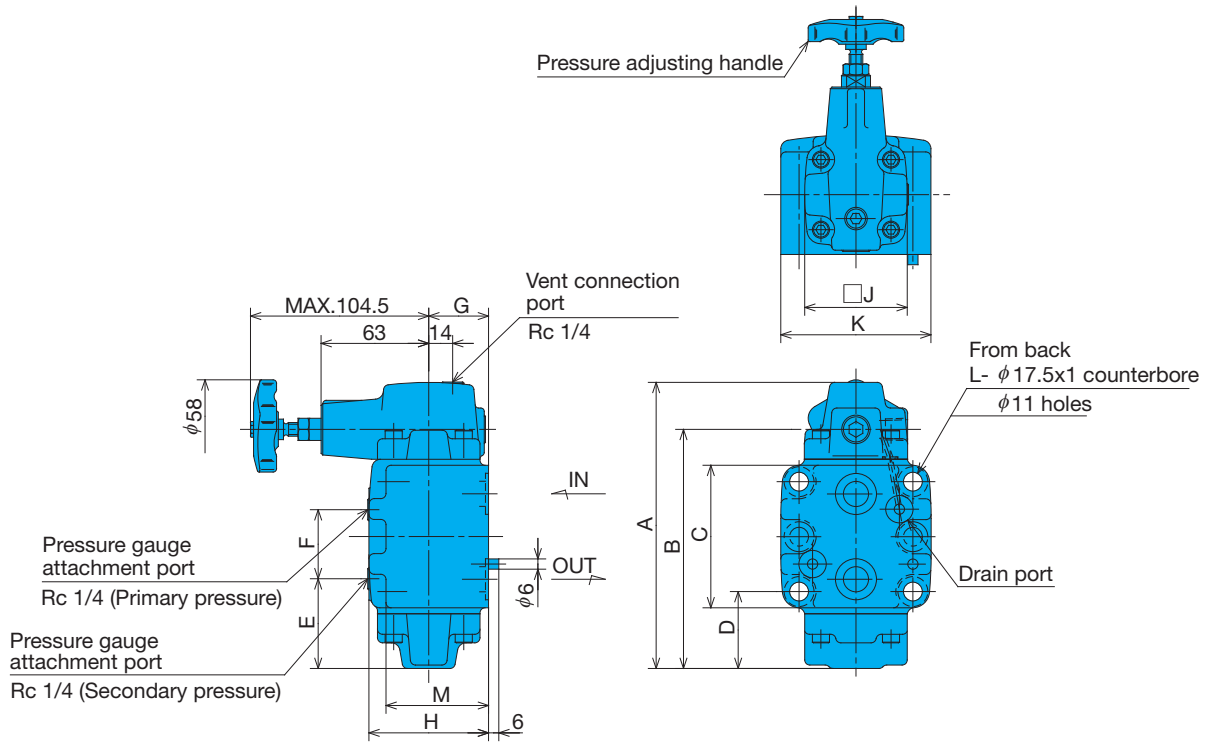
These sub plates can also be used for pressure control valves.

- ④ The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
(C) G-G03-*-21	M10×75ℓ	4	45 to 55 {460 to 560}
(C) G-G06-*-21	M10×85ℓ	4	
(C) G-G10-*-21	M10×105ℓ	6	

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

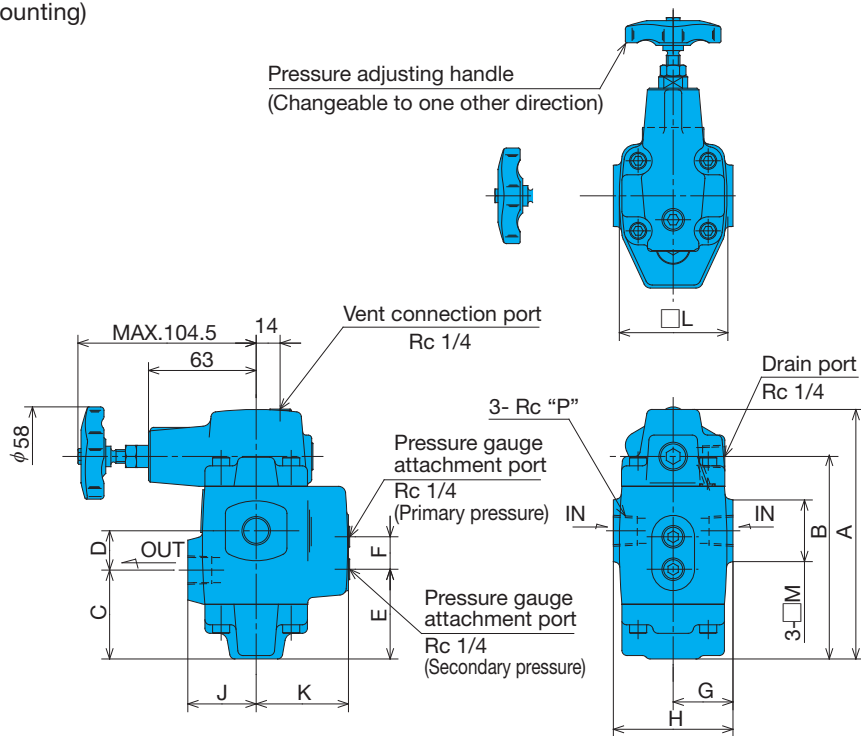
G-G**-*-21 (Gasket Mounting)



Model No.	A	B	C	D	E	F	G	H	J	K	L	M
G-G03-*-21	146	118.5	62	45.1	52.5	19	35	70	60	88	4	60
G-G06-*-21	174	148	82	51.4	64	24	40	80	70	102	4	70
G-G10-*-21	203.5	178.5	102	54	73	30	51	102	92	122	6	92

Note) The orientation of the pressure adjusting handle cannot be change.

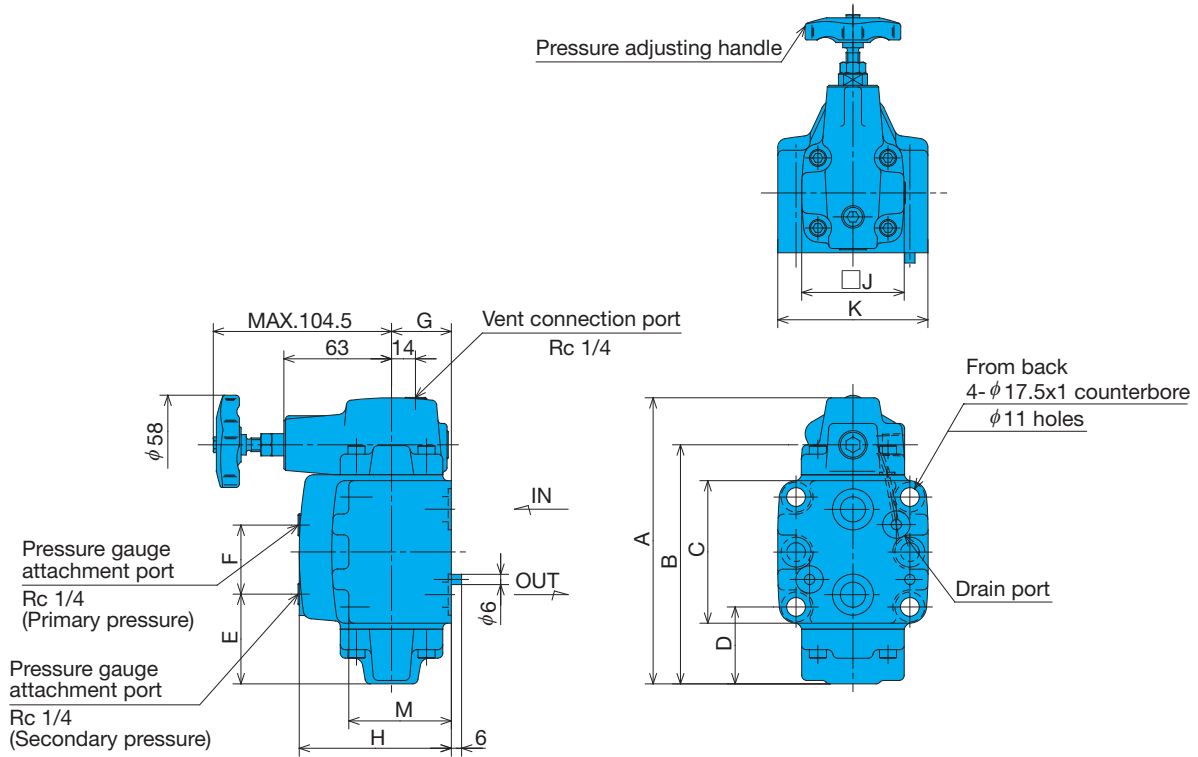
CG-T**-*-21 (Screw Mounting)



Model No.	A	B	C	D	E	F	G	H	J	K	L	M	P
CG-T03-*-21	146	118.5	52	23	52.5	19	35	70	40	54	63	36	3/8
CG-T06-*-21	174	148	66.5	27	64	24	47.5	95	50	60	73	54	3/4
CG-T10-*-21	203.5	178.5	80.5	28	73	30	54	108	68.5	80	95	69	1 1/4

Note) After the orientation of the pressure adjusting handle has been changed, also modify the cover alignment surface O-ring (NBR-90 P6).

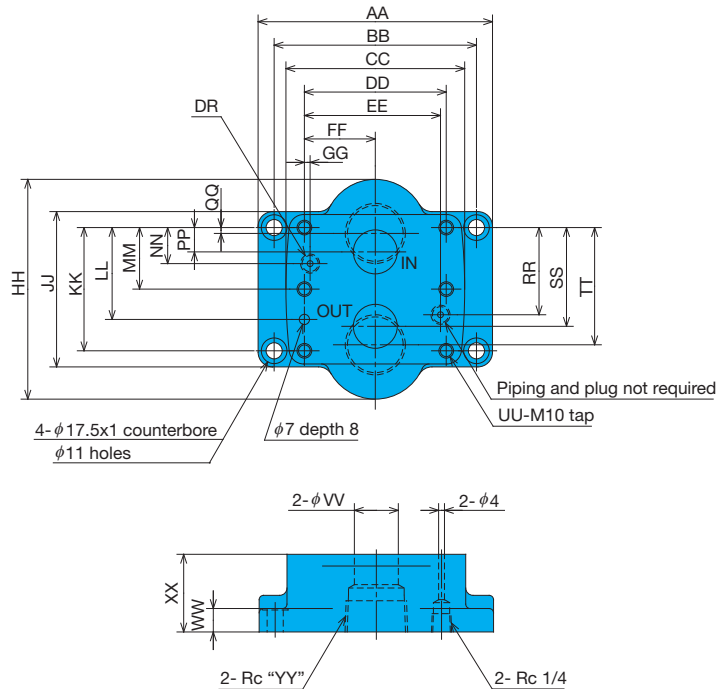
CG-G**-*-21 (Gasket Mounting)



	Dimensions (mm)											
Model No.	A	B	C	D	E	F	G	H	J	K	L	M
CG-G03-*-21	146	118.5	62	45.1	52.5	19	35	89	60	88	4	60
CG-G06-*-21	174	148	82	51.4	64	24	40	100	70	102	4	70
CG-G10-*-21	203.5	178.5	102	54	73	30	51	131	92	122	6	92

Note) The orientation of the pressure adjusting handle cannot be change.

Sub Plate MG-***-20



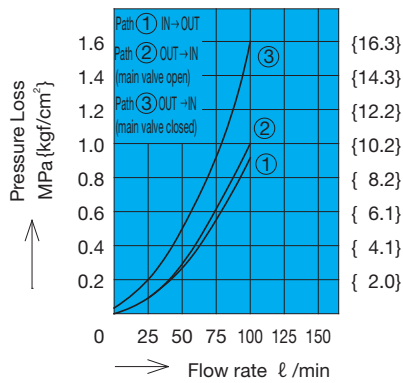
	Dimensions (mm)																						
Model No.	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY
MG-03-20	128	106.4	88	66.6	58.7	33.3	7.9	76	62	42.9	31.8	-	21.4	7.2	3.5	21.5	35.7	39.5	4	14	11	30	3/8
MG-03X-20																							1/2
MG-06-20	146	123.8	102	79.3	72.9	39.7	6.4	110	82	60.3	44.5	-	20.6	11.1	3.7	39.7	49.2	56.7	4	22	16	40	3/4
MG-06X-20																							1
MG-10-20	160	138.1	122	96.8	92.9	48.4	3.9	150	102	84.1	62.7	42.1	24.6	16.7	4.1	59.5	67.5	80.1	6	30	16	53	1 1/4
MG-10X-20																							1 1/2

Performance Curves

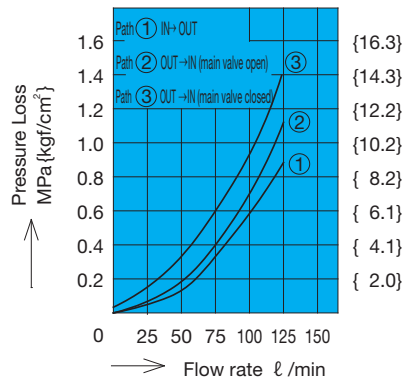
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

(C) G-G03-*-21

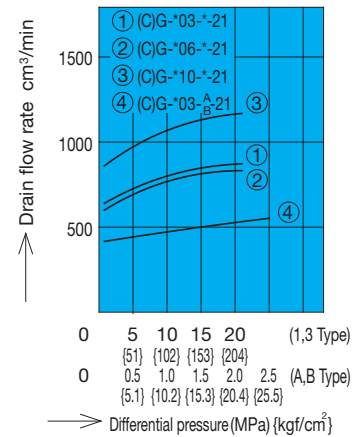


(C) G-G03-*-21

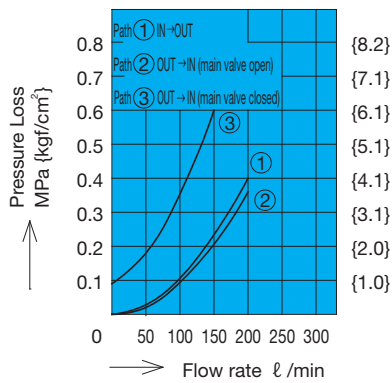


Pressure – Drain Flow Rate Characteristics

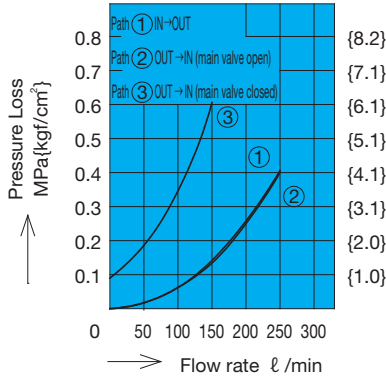
(C) G-***-*-21



(C) G-G06-*-21

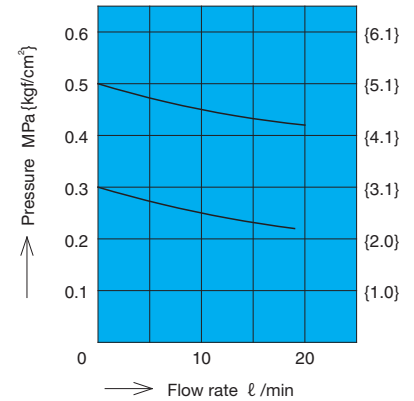


(C) G-T06-*-21

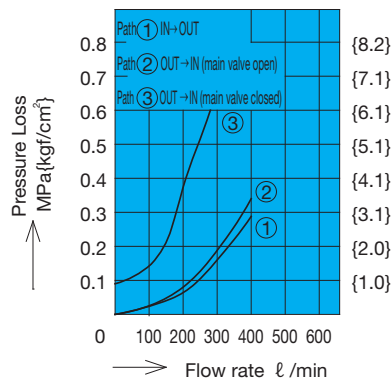


Secondary Pressure – Flow Rate Characteristics

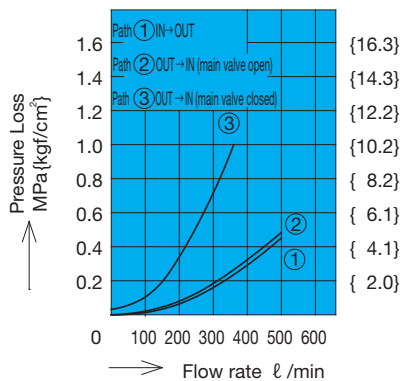
(C) G-03-A-B-21



(C) G-G10-*-21

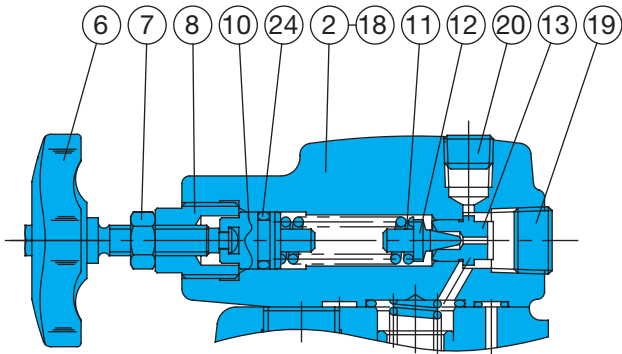


(C) G-T10-*-21

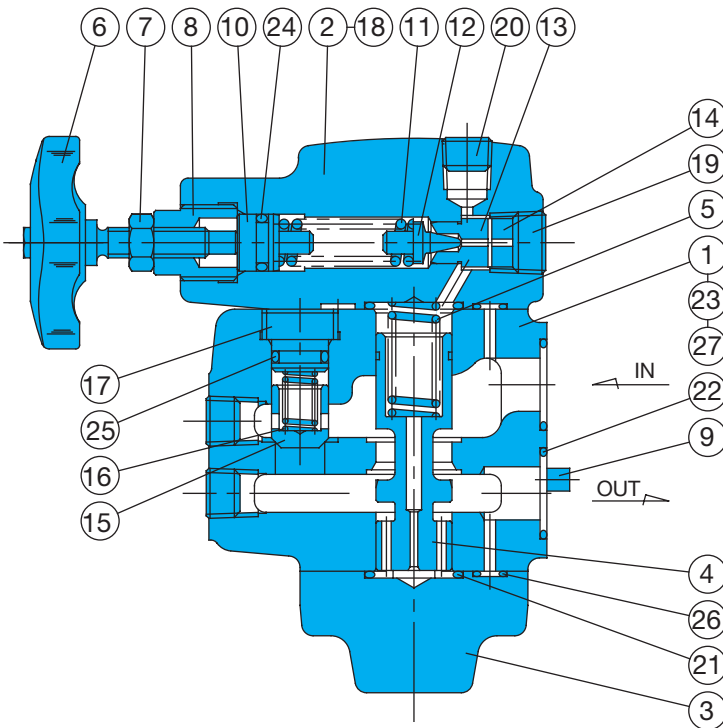


Cross-sectional Drawings

(C) G-G**^A_B-21



CG-G**-*-21



Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Piston
5	Spring
6	Handle
7	Nut
8	Retainer
9	Spring pin
10	Push rod
11	Spring
12	Poppet
13	Seat
14	Collar
15	Poppet
16	Spring
17	Spring guide
18	Screw
19	Plug
20	Plug
21	O-ring
22	O-ring
23	O-ring
24	O-ring
25	O-ring
26	O-ring
27	Nameplate

Note) Part numbers 15, 16, 17, and 25 are not required when there is no check valve.

Seal Part List (Kit Model Number RGBS-*** (C))

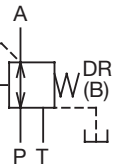
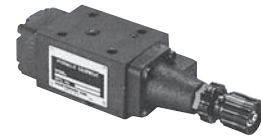
Part No.	Part Name	Type/Part Number						Q'ty
		CG-G03-*-21	CG-T03-*-21	CG-G06-*-21	CG-T06-*-21	CG-G10-*-21	CG-T10-*-21	
21	O-ring	NBR-90 P22	NBR-90 P22	NBR-90 G30	NBR-90 G30	NBR-90 G40	NBR-90 G40	2
22	O-ring	NBR-90 P20	-	NBR-90 P26	-	NBR-90 G35	-	2
23	O-ring	NBR-90 P12	-	NBR-90 P12	-	NBR-90 P12	-	2
24	O-ring	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	NBR-70-1 P11	1
25	O-ring	NBR-90 P11	NBR-90 P11	NBR-90 P14	NBR-90 P14	NBR-90 P22	NBR-90 P22	1
26	O-ring	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	4

Note) The materials and hardness of the O-ring conforms with JIS B2401.

*** in the kit number is used for specification of the valve size (G03, T06, etc.) To specify inclusion of a check valve, add C to the end.

Balancing Valve (Pressure Reducing and Relief Valve)

30 to 50ℓ/min
14MPa



Features

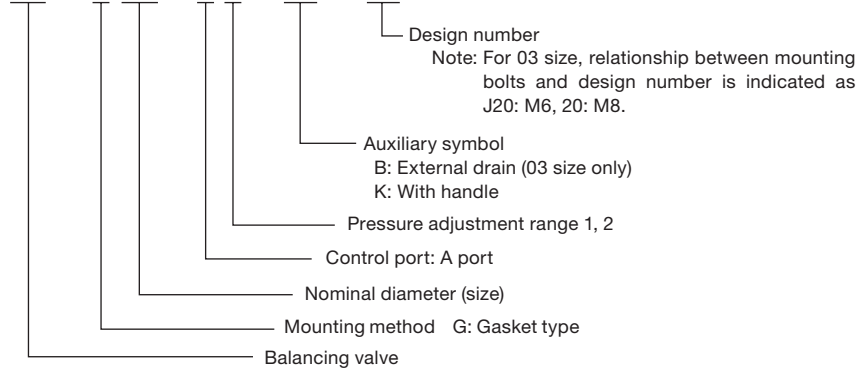
- ① 2-in-1 operation allows a simpler circuit configuration. Combination valve that provides both pressure reducing and counter balance functions.
- ② Pressure adjustment using a single screw (bolt).
- ③ Compact and lightweight valve that can be mounted using the same methods as a 01, 03 size solenoid valve.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
GR-G01-A1-20 A2	1/8	21 {214} P port	30	0.8 to 7 { 8.2 to 71.4 } 3.5 to 14 {35.7 to 143 }	1.5	ISO 4401-03-02-0-05
GR-G03-A1-(B)-20 A2	3/8		50	1.0 to 7 {10.2 to 71.4 } 3.5 to 14 {35.7 to 143 }	3.5	ISO 4401-05-04-0-05

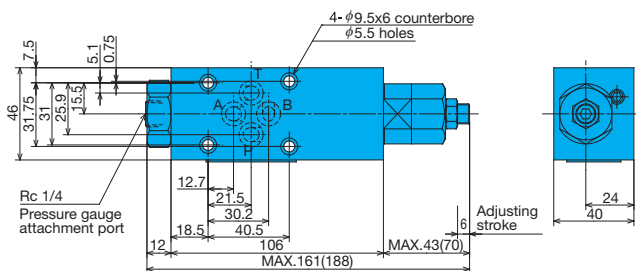
Explanation of model No.

GR - G 03 - A 1 - BK - 20

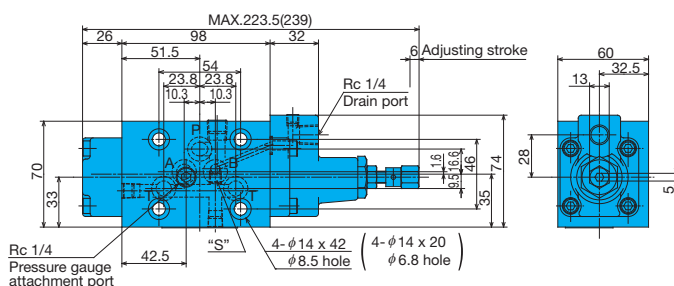


Installation Dimension Drawings

GR-G01-A*-20



GR-G03-A*-B-20



- Note) 1. For size 03, an escape valve with piping from the drain discharge port is standard for the drain (GR-G03-A*-B-20). To change from internal drain to external drain, install a plug (NPTF 1/16) in part S, and remove the drain discharge port plug (RC 1/4). To change from external drain to internal drain, install a plug (RC 1/4) into the drain discharge port, and remove the S part plug (NPTF 1/15). In this case, however, the B port cannot be used as the tank port.
2. Dimensions in parentheses show dimensions with handle (K type).

● Handling

- ① To adjust pressure, loosen the lock nut and then rotate the adjusting screw (bolt) clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- ② For the 01 size, draining is from the gasket side B port.
- ③ For the drain of a 03 size valve when auxiliary symbol B is specified, run a pipe from the drain discharge port directly to the tank. The drain discharge port can also be plugged for direct draining from the gasket side B port. In the case of modification, be sure to change the valve type marking on the nameplate. When using drain piping, use a tightening torque of 22 to 25N·m {215 to 245kgf·cm} for pipe joints.
- ④ The drain of 03 size valve that does not have a B auxiliary symbol can be directly from the T port.
- ⑤ Make sure that drain back pressure is no greater than 0.2MPa {2.0kgf/cm²}.
- ⑥ When an adjustment handle is required for pressure adjustment block, insert K for the type specification.
- ⑦ Set the difference between the pressure at the primary circuit (port P) and the secondary circuit (port A) at least 0.5MPa {5 kgf/cm²}.
- ⑧ Use the following table for specification when a sub plate is required.

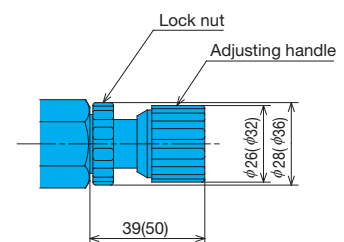
Model No.	Pipe Outlet Size	Weight kg
MSA-01Y-10	3/8	1.2
MS-03-30	3/8	3.8
MS-03X-30	1/2	

- ⑨ The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m{kgf·cm}
GR-G01-A*-20	M5x45	4	5 to 7 {51 to 71}
GR-G03-A*-20	M8x30	4	20 to 25 {205 to 255}
GR-G03-A*-J20	M6x50	4	10 to 13 {102 to 133}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

Adjusting Handle (Option)

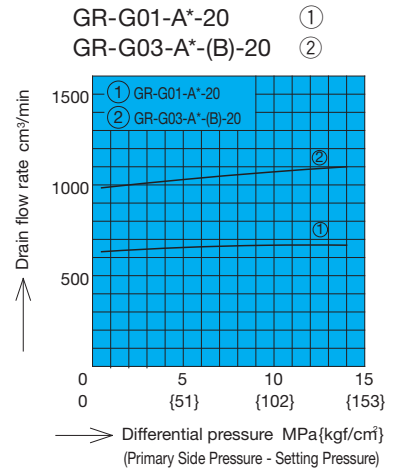
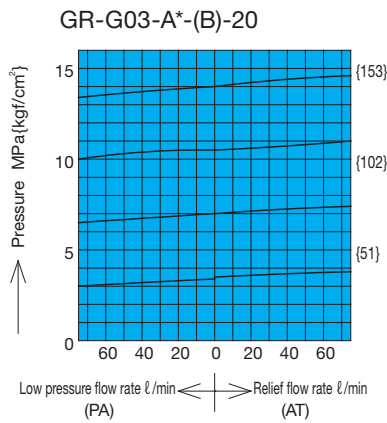
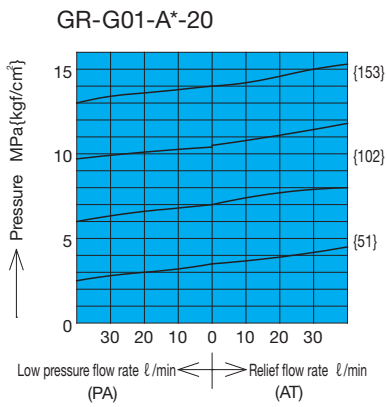


Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure – Flow Rate Characteristics

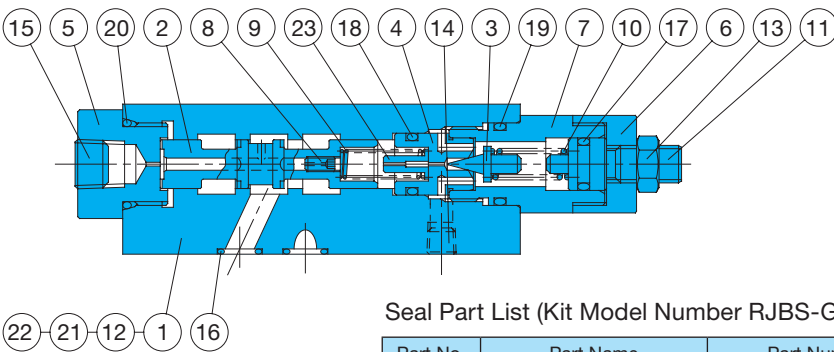
Setting Pressure – Drain Flow Rate Characteristics



Cross-sectional Drawings

Note) The materials and hardness of the O-ring conforms with JIS B2401.

GR-G01-A*-20



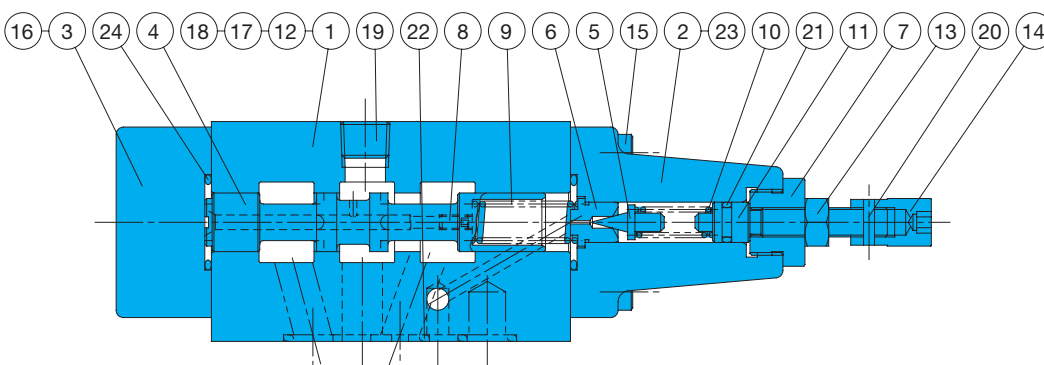
Seal Part List (Kit Model Number RJBS-G01)

Part No.	Part Name	Part Number	Q'ty
16	O-ring	NBR-90 P9	4
17	O-ring	NBR-70-1 P10A	1
18	O-ring	NBR-90 P12.5	1
19	O-ring	NBR-90 P18	1
20	O-ring	NBR-90 P20	1

Part No. Part Name

- 1 Body
- 2 Spool
- 3 Poppet
- 4 Seat
- 5 Bushing
- 6 Bushing
- 7 Retainer
- 8 Choke
- 9 Spring
- 10 Spring
- 11 Screw
- 12 Plate
- 13 Nut
- 14 Plug
- 15 Plug
- 16 O-ring
- 17 O-ring
- 18 O-ring
- 19 O-ring
- 20 O-ring
- 21 Plug
- 22 Spacer
- 23 Choke

GR-G03-A*-B-20



Seal Part List (Kit Model Number RJBS-G03)

Part No.	Part Name	Part Number	Q'ty
21	O-ring	NBR-70-1 P8	1
22	O-ring	NBR-90 P12	5
23	O-ring	NBR-90 P9	1
24	O-ring	NBR-90 P22	2

Part No. Part Name

- 1 Body
- 2 Cover (A)
- 3 Cover (B)
- 4 Spool
- 5 Poppet
- 6 Seat
- 7 Retainer
- 8 Choke
- 9 Spring
- 10 Spring
- 11 Screw
- 12 Plate
- 13 Nut
- 14 Nut
- 15 Screw
- 16 Screw
- 17 Plug
- 18 Plug
- 19 Plug
- 20 Pin
- 21 O-ring
- 22 O-ring
- 23 O-ring
- 24 O-ring



Pressure Control (and Check) Valve

50 to 280ℓ/min
14MPa

Features

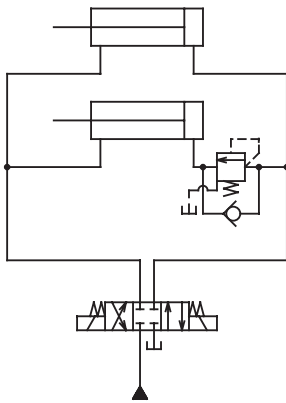
- ① This circuit control valve works as a sequence valve, unloading valve, and counter balance valve.
- ② Maximum operating pressure is 21MPa {214kgf/cm²}.
- ③ Though a direct type valve, there is little pressure override.
- ④ The mounting surface of the gasket conforms to the ISO standards shown in the table below.

Specifications

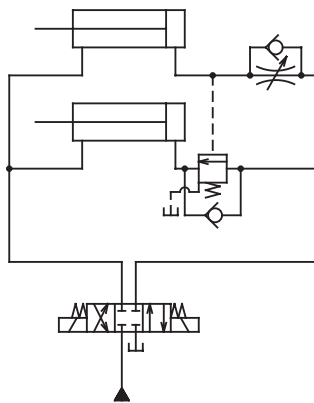
Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Pressure adjustment range MPa(kgf/cm ²)	Weight kg		Gasket Surface Dimensions
Screw Mounting	Gasket Mounting					T Type	G Type	
(C) Q-T03-*A-21 B C D E	(C) Q-G03-*A-21 B C D E	3/8	21 {214} IN, OUT, PP Ports	50	Type A 0.25 to 0.85 {2.6 to 8.7}	2.9 (3.1)	3.5 (3.8)	ISO 5781-06-07-0-00
(C) Q-T06-*A-21 B C D E	(C) Q-G06-*A-21 B C D E	3/4			Type B 0.5 to 1.75 {5.1 to 17.9}	5.0 (5.4)	6.0 (6.5)	
(C) Q-T10-*A-21 B C D E	(C) Q-G10-*A-21 B C D E	1 1/4			Type C 0.85 to 3.5 {8.7 to 35.7}	9.8 (11.1)	11.5 (12.8)	

Weight values in parentheses are for when a check valve is included. The cracking pressure of the check valve is 0.1MPa {1.0kgf/cm²}.

Example circuit 1
When using type 2.

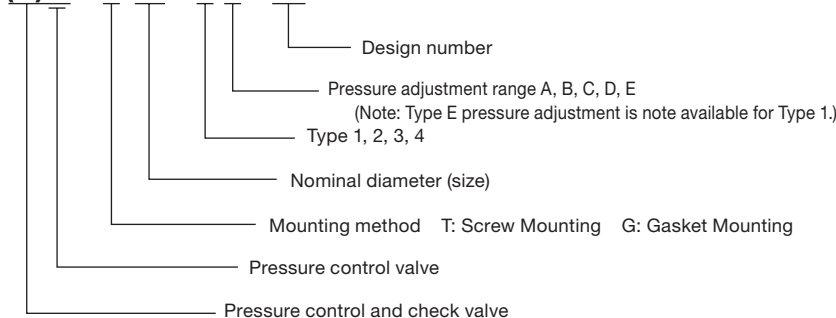


Example circuit 2
When using type 3.



Explanation of model No.

(C)Q - G 10 - 1 B - 21



● Handling

- ① To adjust pressure, loosen the lock nut and then rotate the adjusting bolt clockwise (rightward) to increase pressure or counterclockwise (leftward) to decrease it.
- ② The pressure adjustment range is expressed in terms of cracking pressure.
- ③ Run the out port of Q-T/G** type 1 and 4 directly to the tank.
- ④ The following describes the method for using Types 2 and 3. Application of back pressure to the valve output side such as in the example circuit shown below, use Type 2 or Type 3 and run the drain port directly to the tank.
- ⑤ When two or more of these valves are ganged in sequence, make sure the setting pressure (cracking pressure) differential between them is at least 1MPa {10.2kgf/cm²}.
- ⑥ Vibration (chattering) may occur with the (C) Q-***-1E-21 depending on operating conditions when using type 1 and pressure adjustment range E. Use external drain type 2E if it happens.
- ⑦ Type 2 is standard. When Type 1, 3, or 4 is required, make modifications in accordance with the figures on the next page. Modifications change the valve type, so be sure to change the markings on the nameplate.
- ⑧ Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Weight kg	Applicable Pump Model
MG-03-20	3/8	1.6	(C) Q-G03-**-21
MG-03X-20	1/2		
MG-06-20	3/4	3.9	(C) Q-G06-**-21
MG-06X-20	1		
MG-10-20	1 1/4	6.7	(C) Q-G10-**-21
MG-10X-20	1 1/2		

Note) These sub plates can also be used for reducing valves.

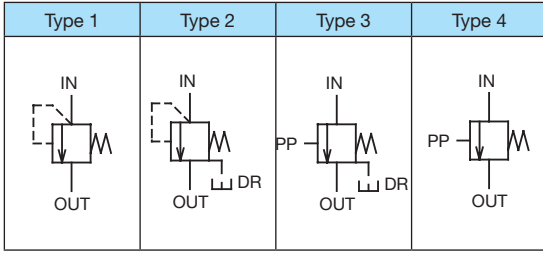
- ⑨ The following are the bundled mounting bolts.

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
(C) Q-G03-**-21	M10×75	4	45 to 55 {460 to 560}
(C) Q-G06-**-21	M10×85	4	
(C) Q-G10-**-21	M10×105	6	

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

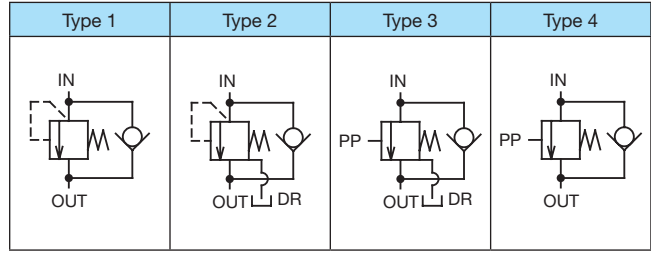
JIS Symbol

Q-***-**-21



Type 2 is standard.

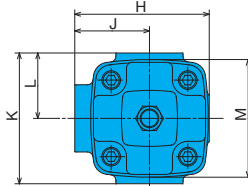
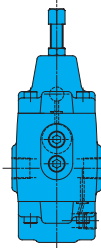
CQ-***-**-21



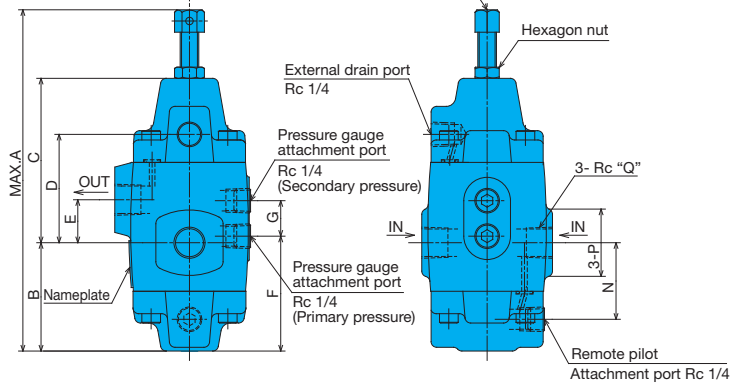
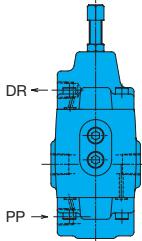
Installation Dimension Drawings

Q-T**-2*-21(Screw Mounting)

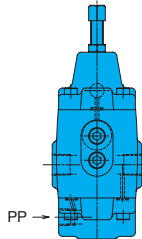
Type 1



Type 3



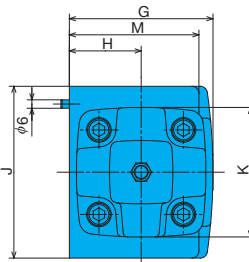
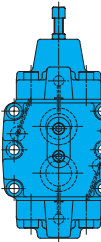
Type 4



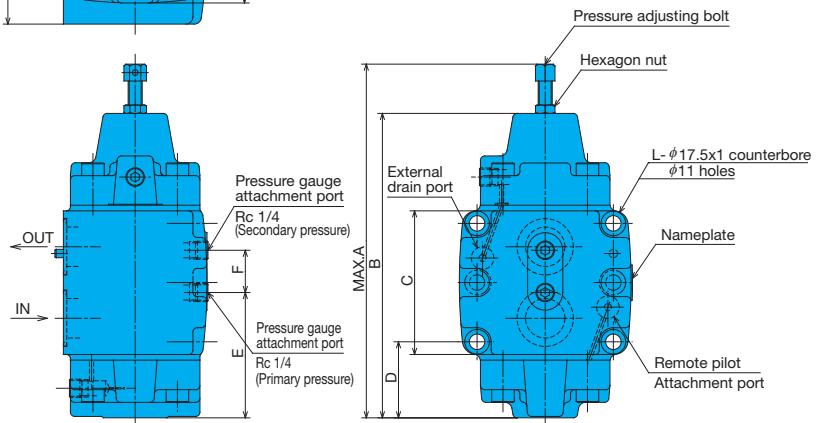
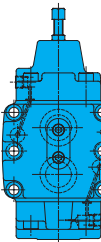
Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
(C) Q-T03**-21	179.5	58	88	58	23	61.5	19	72	40	70	35	63	41	36	3/8
(C) Q-T06**-21	204.5	69.5	101.5	71.5	27	85	24	87	50	95	47.5	73	52.5	54	3/4
(C) Q-T10**-21	251	83.5	132.5	87.5	28	89	30	116	68.5	108	54	95	62.5	69	1 1/4

Q-G**-2*-21 (Gasket Mounting)

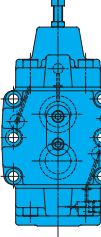
Type 1



Type 3



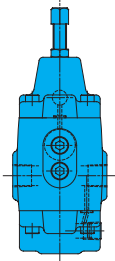
Type 4



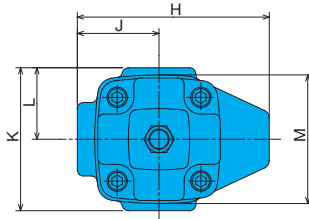
Model No.	A	B	C	D	E	F	G	H	J	K	L	M
Q-G03**-21	179.5	146	62	45.1	61.5	19	72	35	88	60	4	60
Q-G06**-21	204.5	171	82	51.4	75	24	80	40	102	70	4	70
Q-G10**-21	251	216	102	54	89	30	102	51	122	92	6	92

Installation Dimension Drawings

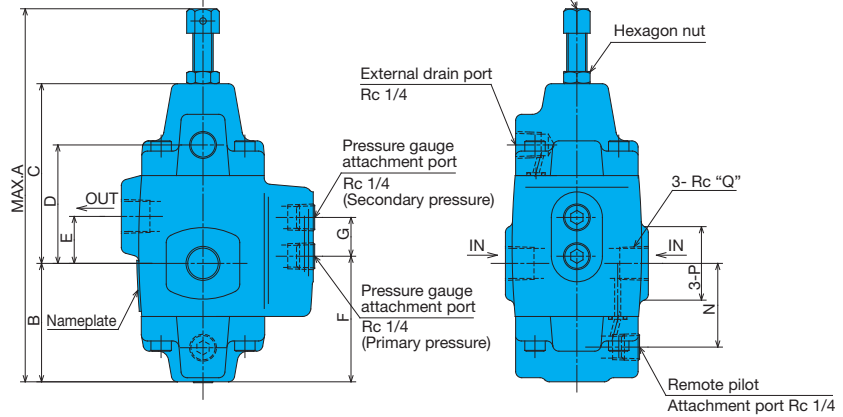
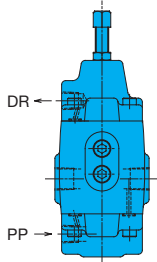
Type 1



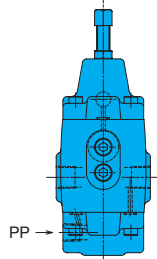
CQ-T**⁻2*-21 (Screw Mounting)



Type 3

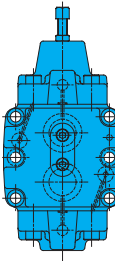


Type 4

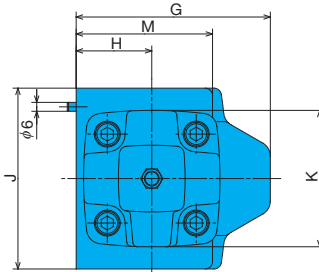


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
CQ-T03 ⁻ ** ⁻ 21	179.5	58	88	58	23	61.5	19	94	40	70	35	63	41	36	3/8
CQ-T06 ⁻ ** ⁻ 21	204.5	69.5	101.5	81.5	27	75	24	110	50	95	47.5	73	52.5	54	3/4
CQ-T10 ⁻ ** ⁻ 21	251	83.5	132.5	87.5	28	89	30	148.5	68.5	108	54	95	62.5	69	1 1/4

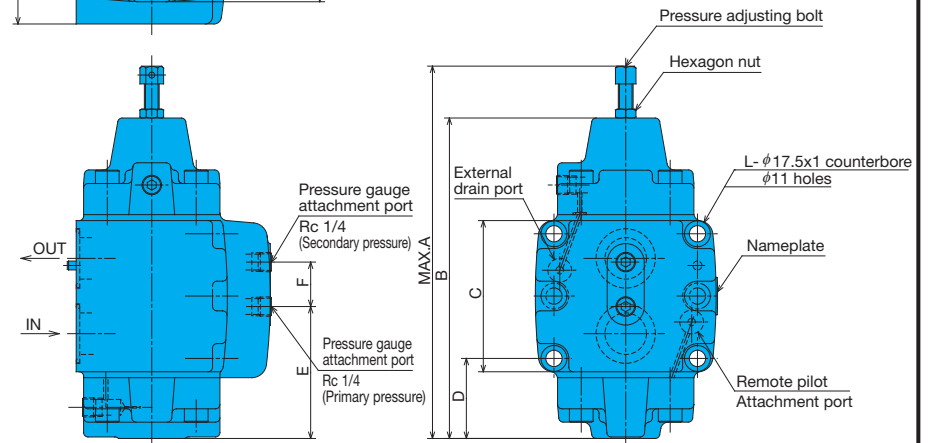
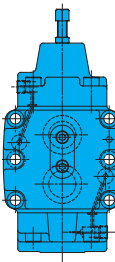
Type 1



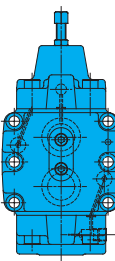
CQ-G**⁻2*-21 (Gasket Mounting)



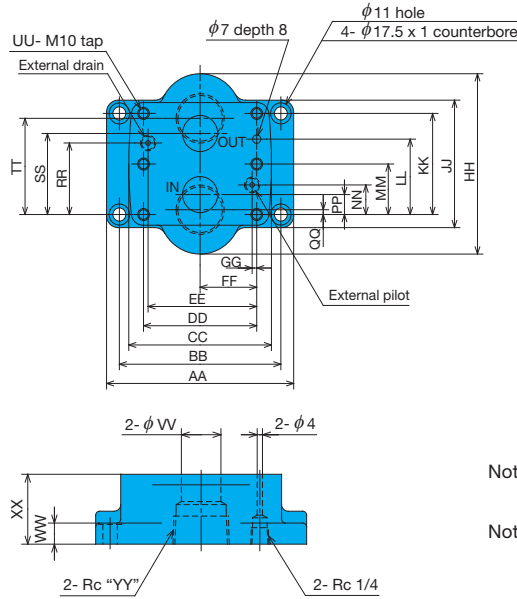
Type 3



Type 4



Model No.	A	B	C	D	E	F	G	H	J	K	L	M
CQ-G03 ⁻ ** ⁻ 21	179.5	146	62	45.1	61.5	19	89	35	88	60	4	60
CQ-G06 ⁻ ** ⁻ 21	204.5	171	82	51.4	75	24	100	40	102	70	4	70
CQ-G10 ⁻ ** ⁻ 21	251	216	102	54	89	30	131	51	122	92	6	92



Note1) The figure shows size 10(X), with four M10 tap holes for size 03(X) and 06(X) valve mounting bolts.

Note2) When a valve cover external drain and external pilot port are used, remove the plugs from the sub plate external drain and external pilot port.

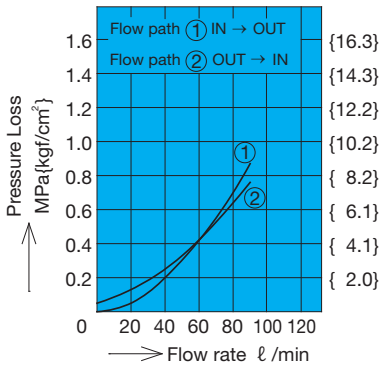
Model No.	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY
MG-03-20	128	106.4	88	66.6	58.7	33.3	7.9	76	62	42.9	31.8	-	21.4	7.2	3.5	21.4	35.7	39.5	4	14	11	30	3/8
MG-03X-20																							1/2
MG-06-20	160	123.8	102	79.3	72.9	39.7	6.4	110	82	60.3	44.5	-	20.6	11.1	3.7	39.7	49.2	56.7	4	22	16	40	3/4
MG-06X-20																							1
MG-10-20	160	138.1	122	96.8	92.9	48.4	3.9	150	102	84.1	62.7	42.1	24.6	16.7	4.1	59.5	67.5	80.1	6	30	16	53	1 1/4
MG-10X-20																							1 1/2

Performance Curves

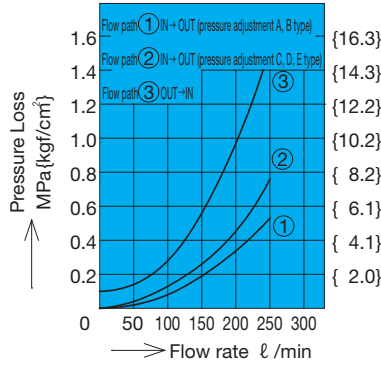
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

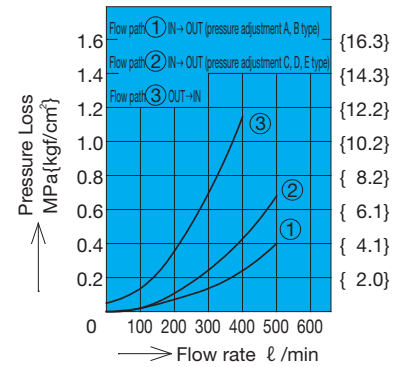
(C) Q-T03-**-21



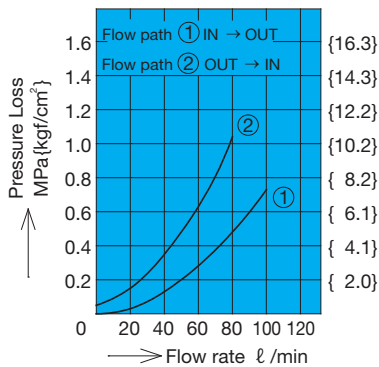
(C) Q-T06-**-21



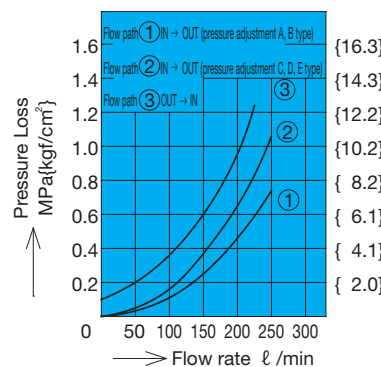
(C) Q-T10-**-21



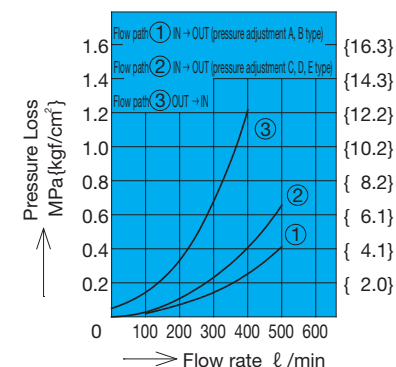
(C) Q-G03-**-21



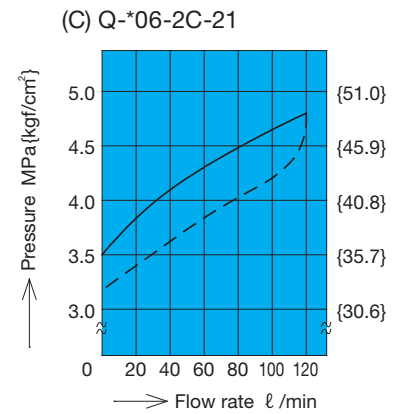
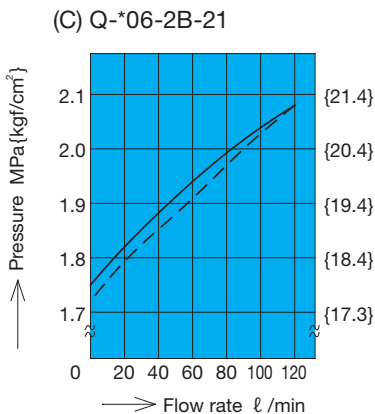
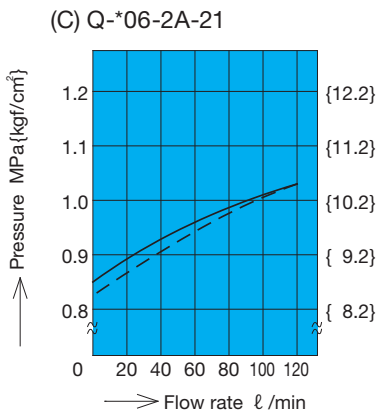
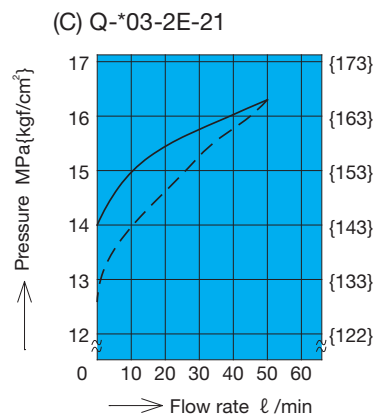
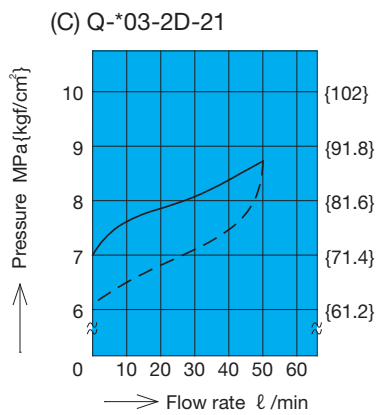
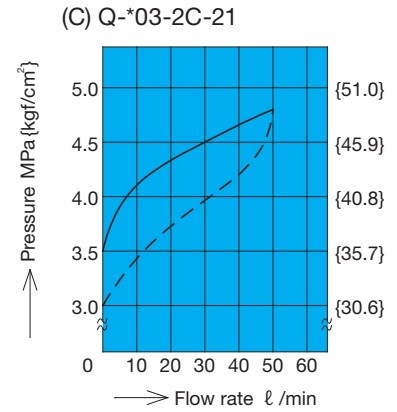
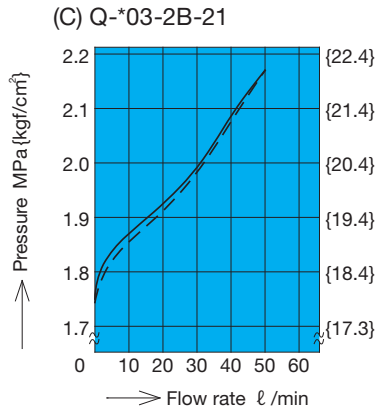
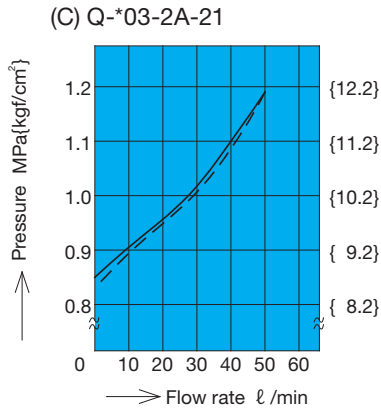
(C) Q-G06-**-21



(C) Q-G10-**-21

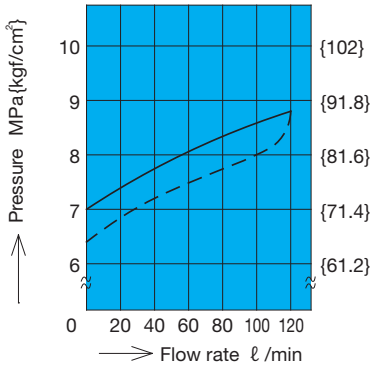


Pressure – Flow Rate Characteristics (— : Press rise
 (- - - : Pressure drop)

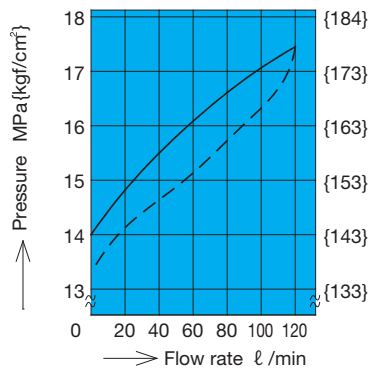


Pressure – Flow Rate Characteristics (— : Press rise
 (- - - : Pressure drop)

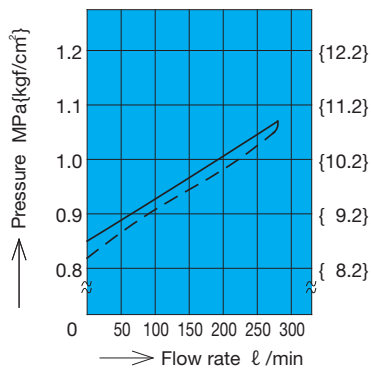
(C) Q-*06-2D-21



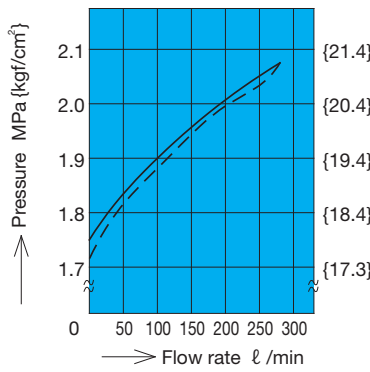
(C) Q-*06-2E-21



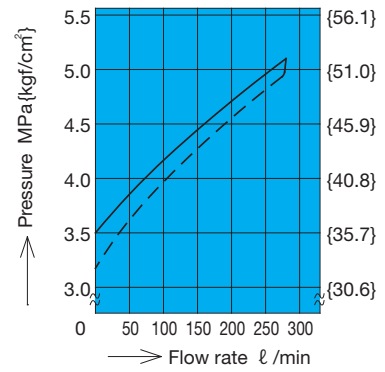
(C) Q-*10-2A-21



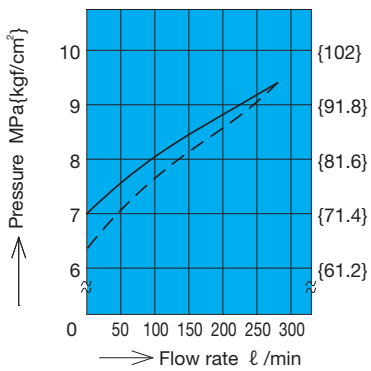
(C) Q-*10-2B-21



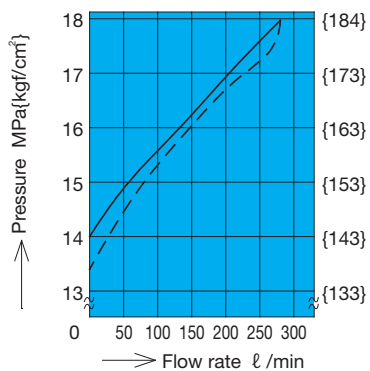
(C) Q-*10-2C-21



(C) Q-*10-2D-21

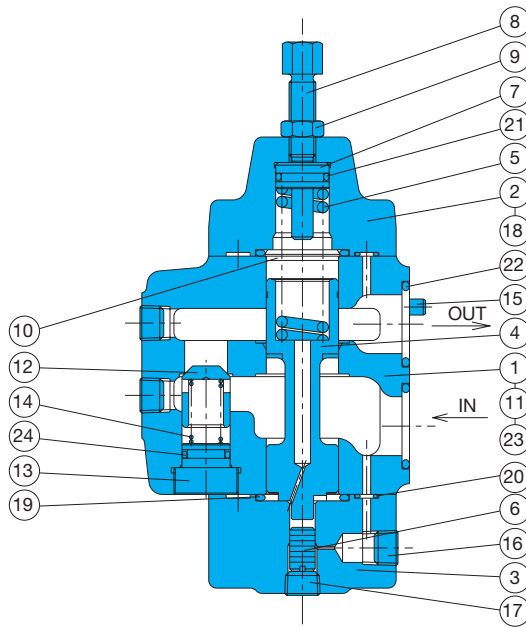


(C) Q-*10-2E-21



Cross-sectional Drawing

CQ-G**-**-21



Part No.	Part Name
1	Body
2	Cover
3	Cover
4	Piston
5	Spring
6	Plunger
7	Push rod
8	Screw
9	Nut
10	Spacer
11	Nameplate
12	Poppet
13	Spring guide
14	Spring
15	Pin
16	Plug
17	Plug
18	Screw
19	O-ring
20	O-ring
21	O-ring
22	O-ring
23	O-ring
24	O-ring

Note) Part numbers 12, 13, 14, and 24 are not required when there is no check valve.

Note) The illustration shows the configuration for pressure adjustment ranges Type C, Type D, and Type E. For Type A and Type B, part number 6 plunger is eliminated, and the part number 4 piston, part number 5 spring are different.

Seal Part List (Kit Model Number RQBS-***C)

Part No.	Part Name	Type/Part Number						Q'ty
		CQ-G03**-**-21	CQ-T03**-**-21	CQ-G06**-**-21	CQ-T06**-**-21	CQ-G10**-**-21	CQ-T10**-**-21	
19	O-ring	NBR-90 P22	NBR-90 P22	NBR-90 G30	NBR-90 G30	NBR-90 P40	NBR-90 G40	2
20	O-ring	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	NBR-90 P6	4
21	O-ring	NBR-90 P11	NBR-90 P11	NBR-90 P16	NBR-90 P16	NBR-90 P22A	NBR-90 P22A	1
22	O-ring	NBR-90 P20	-	NBR-90 P26	-	NBR-90 G35	-	2
23	O-ring	NBR-90 P12	-	NBR-90 P12	-	NBR-90 P12	-	2
24	O-ring	NBR-90 P11	NBR-90 P11	NBR-90 P14	NBR-90 P14	NBR-90 P22	NBR-90 P22	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
For the *** part of the kit number, specify the valve size (G03, T06). To specify inclusion of a check valve, add C to the end.



Throttle (and Check) Valve

190ℓ/min
21MPa



Features

- ① Compact and lightweight, requires very little space for installation.
- ② Special needle valve configuration provides smooth flow rate control.
- ③ Pressure is internally balanced for light handle operation, even at high pressure.

Specifications

Model No.		Nominal Diameter (Size)	Maximum Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm ² }	Maximum Working Pressure MPa{kgf/cm ² }	Weight kg	
Screw Mounting	Gasket Mounting					T Type	G Type
(C)FR-T03-10	(C)FR-G03-10	3/8	30	0.15{1.5}	21{214}	1.3	1.7
(C)FR-T06-10	(C)FR-G06-10	3/4	75	0.1 {1.0}		3.0	3.7
(C)FR-T10-10	(C)FR-G10-10	1¼	190			5.6	5.8

● Handling

- ① The control flow rate is increased by counter clockwise (leftward) rotation of the flow rate control handle.
- ② The control flow rate does not become zero even if the handle is fully turned.
- ③ There is no pressure or temperature compensation mechanism.
- ④ Bi-directional restriction is possible when there is no check valve.
- ⑤ Use the table to the right for specification when a sub plate is required.
- ⑥ See the table to the right for installation hex socket bolts. However, bolts are not included for a screw mounting type.

Applicable Pump Model	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
(C)FR-G03-10	M8 × 65ℓ	4	20 to 25{ 205 to 255}
(C)FR-G06-10	M12 × 75ℓ	4	75 to 95{ 765 to 969}
(C)FR-G10-10	M14 × 90ℓ	4	120 to 150{1220 to 1530}

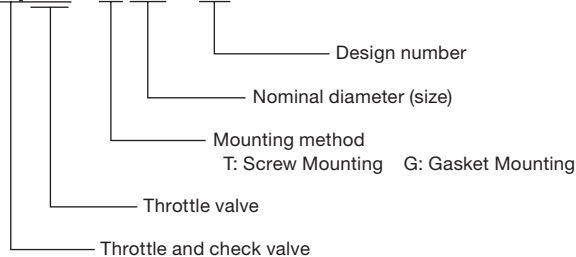
Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

● Sub Plate

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type
MFR-03-10	3/8	30	1.0	(C)FR-G03-10
MFR-06-10	3/4	75	2.2	(C)FR-G06-10
MFR-10-10	1¼	190	4.1	(C)FR-G10-10

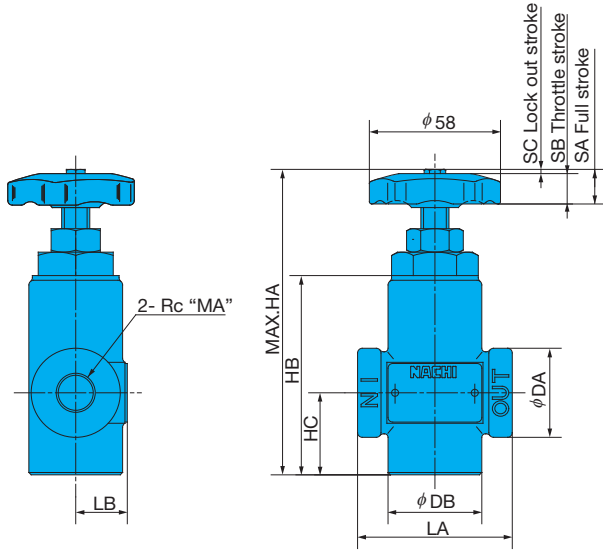
Explanation of model No.

(C)FR - G 03 - 10



Installation Dimension Drawings

(C)FR-T**-10 (Screw Mounting)

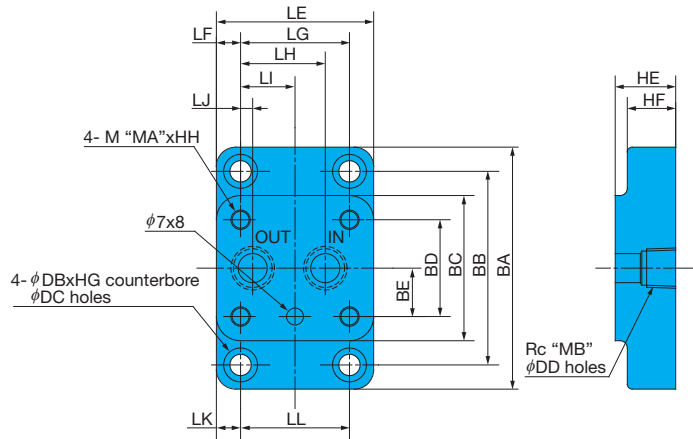
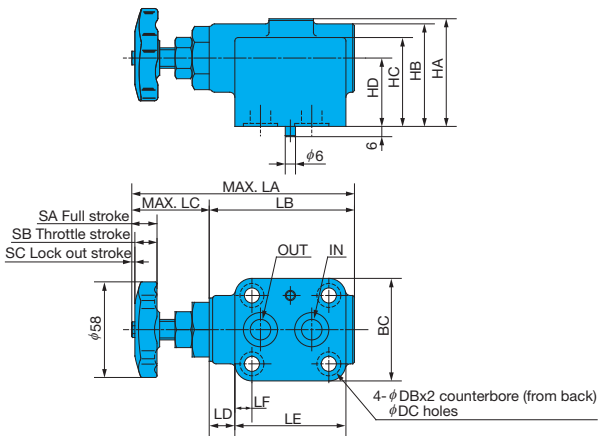


Model No.	LA	LB	DA	DB
(C)FR-T03-10	66	21.5	38	40
(C)FR-T06-10	95	30.5	55	55
(C)FR-T10-10	130	38.5	74	70

HA	HB	HC	SA	SB	SC	MA
130.5	85	35	7	6	1	3/8
175.5	123	55	10	9	1	3/4
206.5	150	70	14	12	2	1 1/4

(C)FR-G**-10 (Gasket Mounting)

Sub Plate MFR**-10



DB	DC	DD	MA	MB	SA	SB	SC
14	8.8	12	8	3/8	7	6	1
20	13	20	12	3/4	10	9	1
23	15	30	14	1 1/4	14	12	2

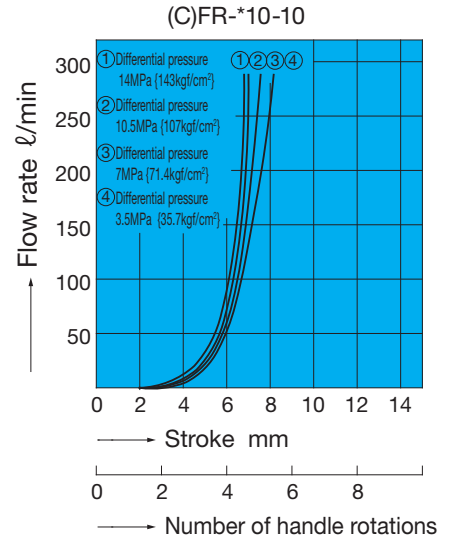
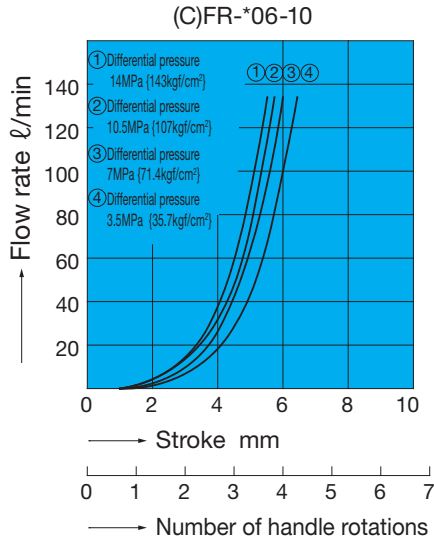
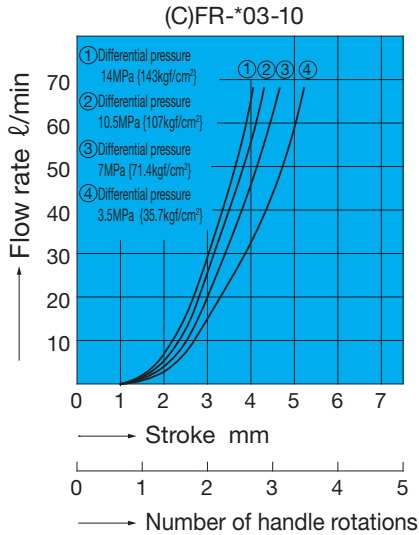
Model Number	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	BA	BB	BC	BD	BE	HA	HB	HC	HD	HE	HF	HG	HH
(C)FR-G03-10	130.5	85	45	15	65	10	45	35	22.5	5	10	45	100	80	60	40	20	63	60	52	40	25	20	8.6	18
(C)FR-G06-10	175.5	123	52	14	96	13	70	55	35	15	14	68	132	106	80	54	27	71	68	57	40	30	25	13	20
(C)FR-G10-10	206.5	150	56	14	120	15	90	72.5	45	17.5	16	88	154	122	90	60	30	83	80	68	45	40	35	15.2	25



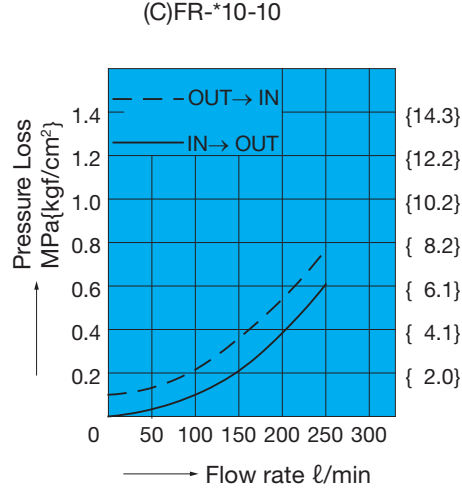
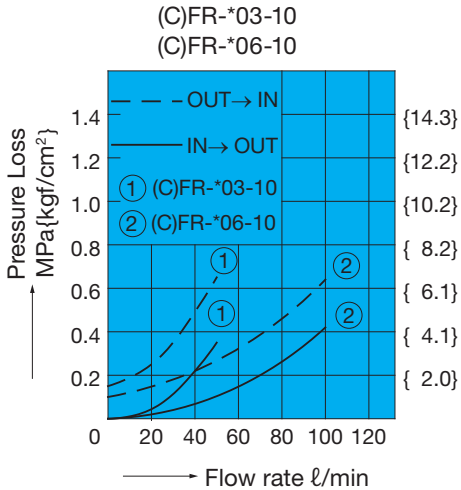
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Stroke – Flow Rate Characteristics

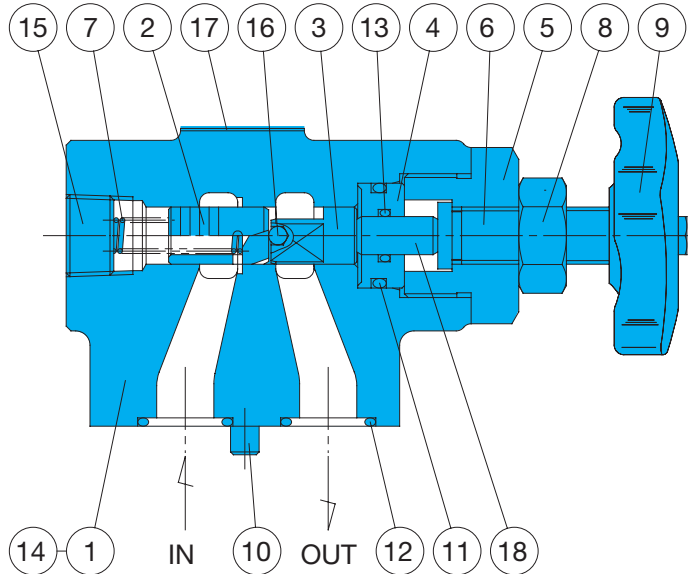


Pressure Loss Characteristics



Cross-sectional Drawing

CFR-G*-10

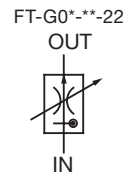


Part No.	Part Name
1	Body
2	Poppet
3	Piston
4	Bracket
5	Stopper
6	Screw
7	Spring
8	Nut
9	Handle
10	Pin
11	O-ring
12	O-ring
13	O-ring
14	Plug
15	Plug
16	Ball
17	Plate
18	Rod

Seal Part List (Kit Model Number FSS-***)

Part No.	Part Name	CFR-G03-10		CFR-G06-10		CFR-G10-10	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
11	O-ring	NBR-90 P18	1	NBR-90 G25	1	NBR-90 G25	1
12	O-ring	NBR-90 P16	2	NBR-90 G25	2	NBR-90 G35	2
13	O-ring	NBR-90 P8	1	NBR-90 P8	1	NBR-90 P8	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.
 *** in the kit number is used for specification of the valve size (G03, T06, etc.)

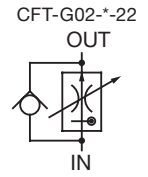


FT Type Flow Control (and Check) Valve (With Pressure and Temperature Compensation)

0.05 to 106ℓ/min
21MPa

Features

- ① Pressure compensation and temperature compensation mechanisms provide a stable control flow rate, even when oil temperature fluctuates.
- ② A wider control flow rate range as well as easier minute flow rate adjustability than previous products.



Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Reverse Flow Rate ℓ/min	Cracking pressure MPa(kgf/cm ²)	Weight kg	Gasket Surface Dimensions
(C)FT-G02- 8-22 30-22	1/4	0.05 to 8 0.1 to 30	21{214}	50	0.1{1.0}	3.7	ISO 6263-06-05-0-97
FT-G03- 42-22 106-22	3/8	0.1 to 42 0.2 to 106		*120		7.9	ISO 6263-07-09-0-97

Asterisk (*) indicates values for auxiliary plate with check valve.

● Handling

- ① In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
- ② In the pressure range of 1.0 to 21MPa {10.2 to 214kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
- ③ Note that flow rate fluctuation exceeds the rated fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- ④ When controlling flow rates that are less than 0.2ℓ/min, use with a filter that does not exceed 10μm.
- ⑤ For flow rate control, make sure that the pressure differential between the input port and output port is at least 1MPa {10.2kgf/cm²}.
- ⑥ The control flow rate is increased by clockwise (rightward) rotation of the control handle.

- ⑦ See the table below for installation hex socket bolts.

- ⑧ Use the following table for specification when a sub plate is required.

● Sub Plate and Auxiliary Plate Application Table

Name	Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type	Use With Sub Plate	
Sub Plate	MF-02X-10	3/8	30	2.2	(C)FT-G02*-**-22	—	
	MF-02Y-20	1/2	50				
Sub Plate	MF-03-10	3/8	42	3.3	FT-G03*-**-22	—	
	MF-03Y-20	3/4	75				
	MF-03Z-20	1	120				
Sub Plate with Check Valve	MF-03Y-C-22	3/4	75	5.7			—
	MF-03Z-C-22	1	120				
Auxiliary Plate A with Check Valve	MCF-03-A-22	φ 23	120	3.2			—

- ⑨ Though FT-G03 does not have a built-in check valve, a sub plate with check valve and auxiliary plate with check

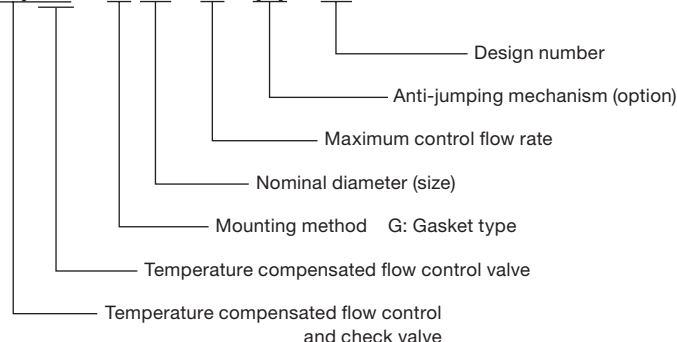
valve is used in addition to the normal sub-plate. (Use the auxiliary plate in combination with the sub plate.)

Applicable Model	Bolt Size	Q'ty	Tightening Torque N·m(kgf·cm)
(G)FT-G02*-**-22	M8 × 55ℓ	4	20 to 25{205 to 255}
FT-G03*-**-22	M10 × 75ℓ	4	45 to 55{460 to 560}
With FT-G03 Auxiliary Plate	M10 × 110ℓ	4	45 to 55{460 to 560}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

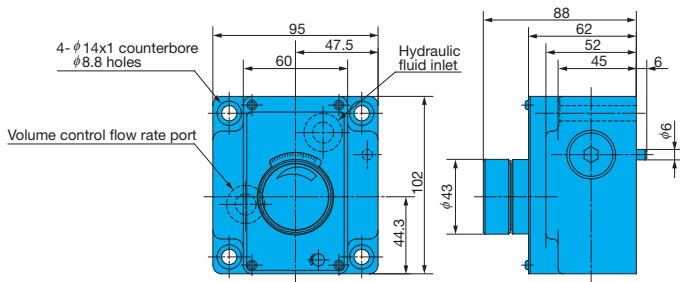
Explanation of model No.

(C) FT - G 02 - 8 - (F) - 22

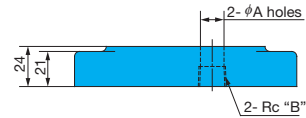
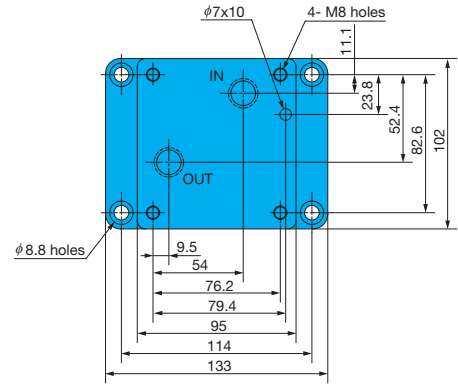


Installation Dimension Drawings

(C)FT-G02-**-22

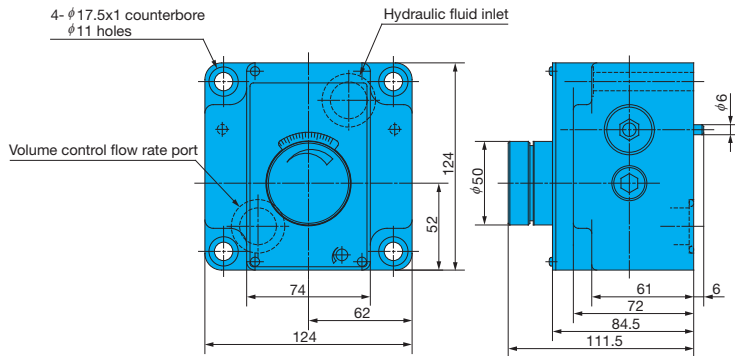


Sub Plate MF-02*-*



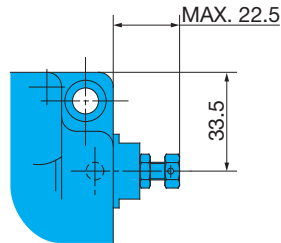
Sub Plate	A	B
MF-02X-10	14.7	3/8
MF-02Y-20	17	1/2

FT-G03-**-22

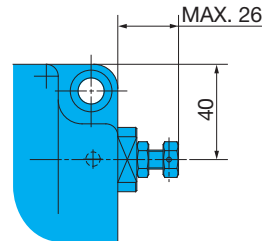


Anti-jumping mechanism

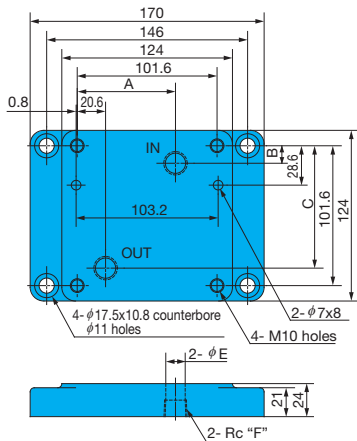
(C)FT-G02-*-F-22



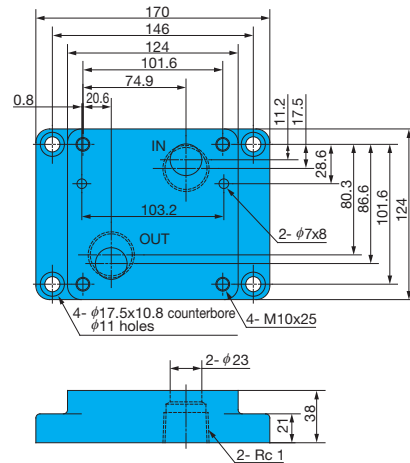
(C)FT-G03-*-F-22



Sub Plate MF-03-10
MF-03Y-20

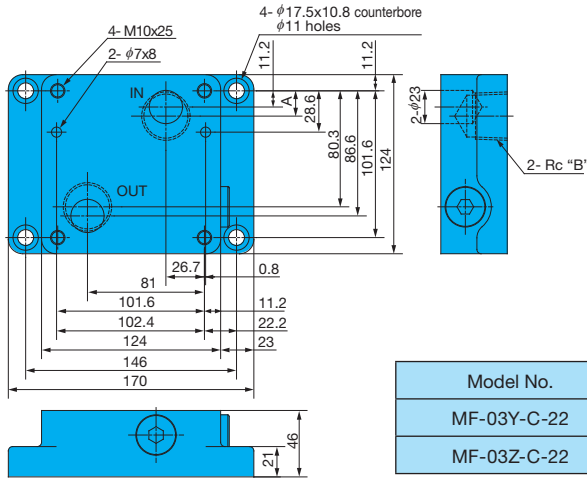


MF-03Z-20

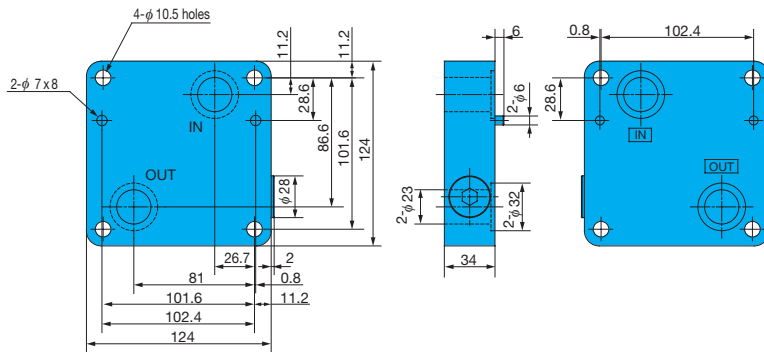


Sub Plate	A	B	C	E	F
MF-03-10	71.4	12.7	88.9	14.7	3/8
MF-03Y-20	74.9	11.2	86.6	23.0	3/4

Sub Plate with Check Valve MF-03*-C-22



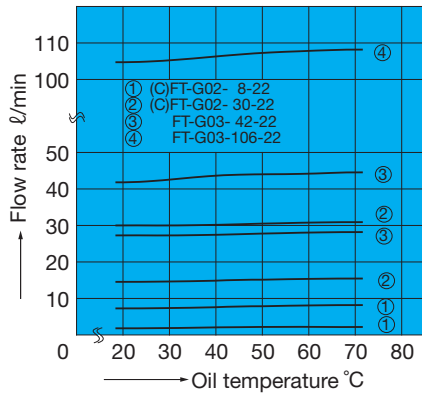
Auxiliary Plate with Check Valve MCF-03-A-22



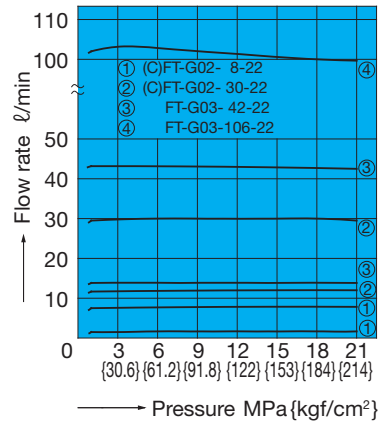
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

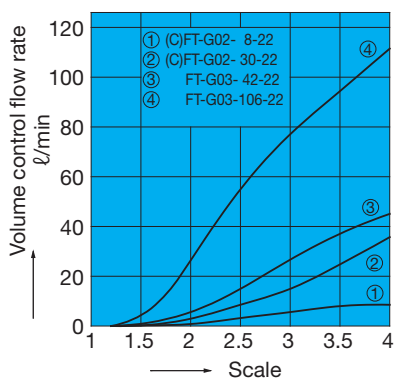
Oil Temperature – Control Flow Rate Characteristics



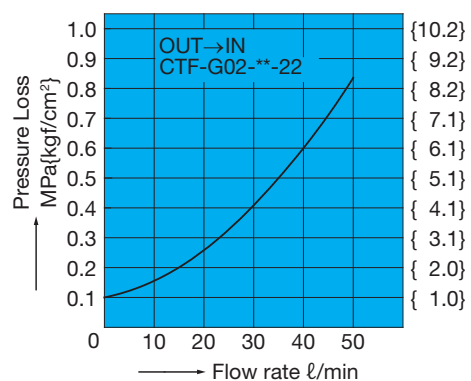
Pressure – Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

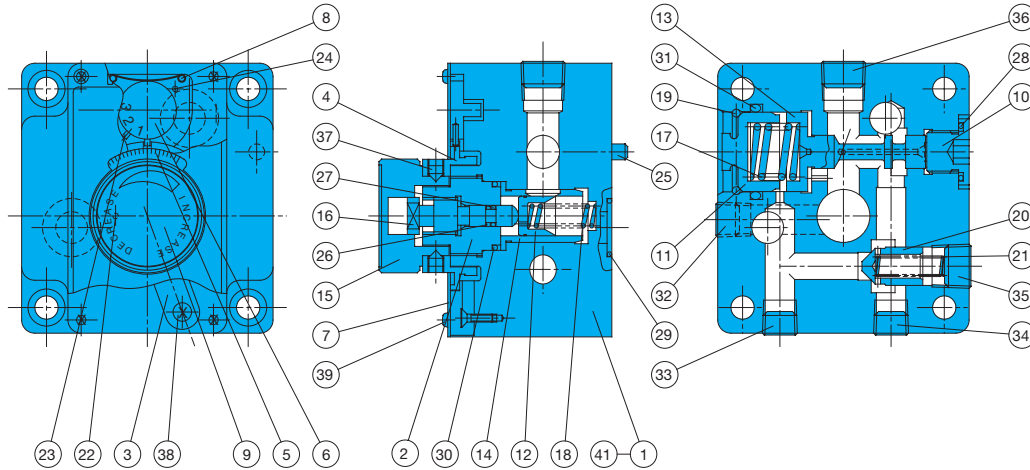


Pressure Loss Characteristics



Cross-sectional Drawings

CFT-G02-*-22



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	15	Knob	29	O-ring
2	Retainer	16	Screw	30	O-ring
3	Stopper	17	Spring	31	O-ring
4	Dial	18	Spring	32	Plug
5	Plate	19	Snap ring	33	Plug
6	Plate	20	Poppet	34	Plug
7	Plate	21	Spring	35	Plug
8	Spring	22	Pin	36	Plug
9	Plate	23	Pin	37	Screw
10	Plug	24	Pin	38	Screw
11	Plug	25	Pin	39	Screw
12	Throttle	26	Backup ring	40	Washer
13	Piston	27	O-ring	41	O-ring
14	Sleeve	28	O-ring		

List of Sealing Parts

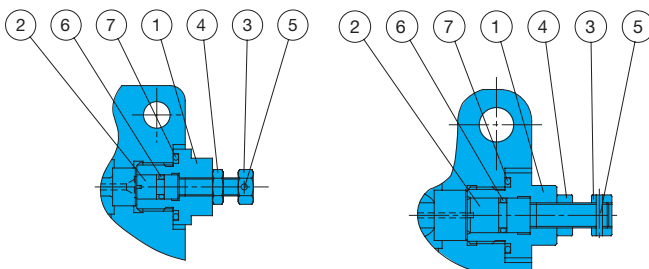
Part No.	Part Name	(C)FT-G02-*-22		FT-G03-*-22	
		Part Number	Q'ty	Part Number	Q'ty
26	Backup ring	T2-P5	1	T2-P5	1
27	O-ring	NBR-90 P5	1	NBR-90 P5	1
28	O-ring	NBR-90 P18	1	NBR-90 P20	1
29	O-ring	NBR-90 P18	2	NBR-90 P26	2
30	O-ring	NBR-90 P22	1	NBR-90 P26	1
31	O-ring	NBR-90 P30	1	NBR-90 P38	1
41	O-ring	-	-	NBR-90 P20	1
Seal Kit Number		FBBS-G02-1A		FBBS-G03	

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. Backup ring indicates JIS B2407-T2**.

Anti-jumping mechanism

(C)FT-G02-*-F-22

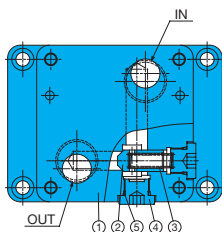
(C)FT-G03-*-22



Anti-jumping mechanism

Part No.	Part Name
1	Retainer
2	Bolt
3	Nut
4	Nut
5	Spring pin
6	O-ring
7	O-ring

Sub Plate MF-03*-C-22

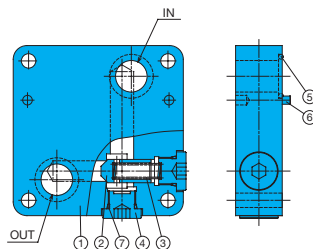


Part No.	Part Name	Part No.	Part Name
1	Sub Plate	4	Plug
2	Poppet	5	O-ring
3	Spring		

List of Sealing Parts

Part No.	Part Name	Part Number	Q'ty
5	O-ring	NBR-90 P18	2

MCF-03-A-22



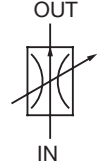
Part No.	Part Name
1	Sub Plate
2	Poppet
3	Spring
4	Plug
5	O-ring
6	Pin
7	O-ring
8	Screw

List of Sealing Parts

Part No.	Part Name	Part Number	Q'ty
5	O-ring	NBR-90 P26	2
7	O-ring	NBR-90 P18	2



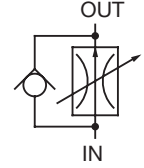
F-G***-20



F Type Flow Control (and Check) Valve (With Pressure Compensation)

9 to 373ℓ/min
21MPa

CF-G***-20



Features

- ① Wide control flow rate range.
- ② A pressure compensation mechanism ensures that the control flow rate does not change, even when there is pressure fluctuation.

Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa{kgf/cm ² }	Cracking pressure MPa{kgf/cm ² }	Weight kg	Gasket Surface Dimensions
(C)F-G06-170-20	3/4	9 to 170	21{214}	0.1{1.0}	20.5	ISO 6263-08-13-0-97
(C)F-G10-373-20	1 1/4	20 to 373			43.1	—

● Handling

- ① In the pressure range of 1.0 to 21MPa {10.2 to 214kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
- ② For flow rate control, make sure that the pressure differential between the input port and output port is at least 1.0MPa {10.2kgf/cm²}.
- ③ The control flow rate is increased by clockwise (rightward) rotation of the control handle.
- ④ See the table below for installation hex socket bolts.
- ⑤ Use the following table for specification when a sub plate is required.

Sub Plate Application Table

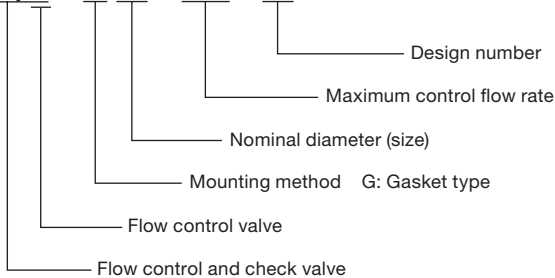
Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type
MF-06-20	3/4	106	6.3	(C)F-G06-170-20
MF-06X-20	1	170	9.7	

Applicable Model	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
(C)F-G06	M16 × 100ℓ	4	190 to 235{1940 to 2400}
(C)F-G10	M20 × 115ℓ	4	370 to 460{3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

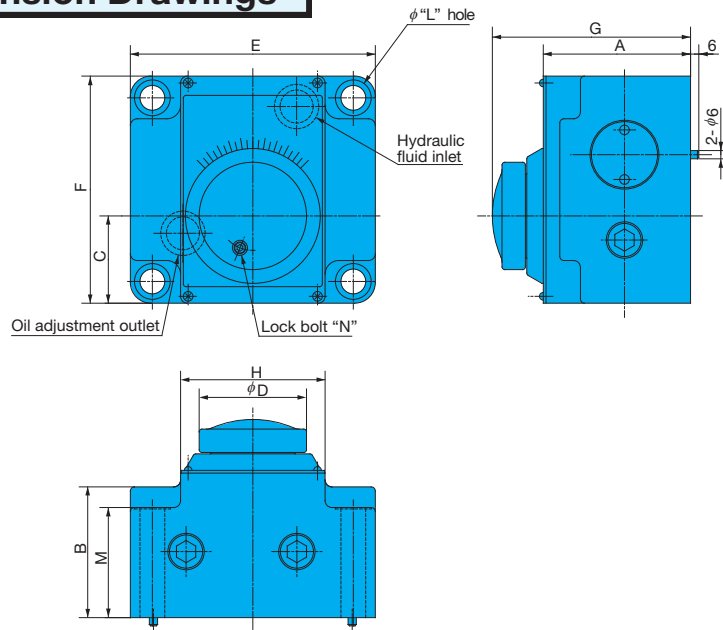
Explanation of model No.

(C) F - G 06 - 170 - 20



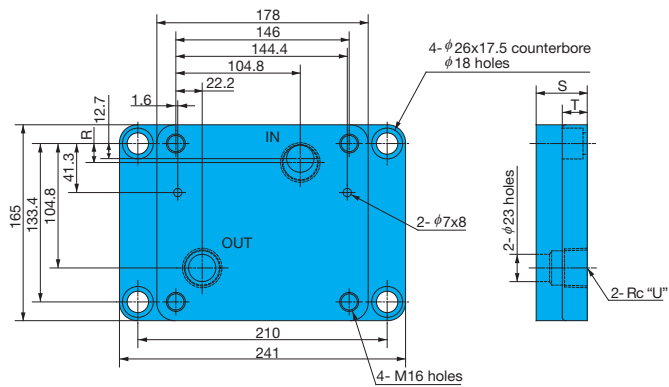
Installation Dimension Drawings

(C)F-G**-*-20



Model No.	Dimensions mm												
	A	B	C	D	E	F	G	H	J	K	L	M	N
(C)F-G06-*-20	107	95	63.4	80	178	165	144.5	105	26	1	18	80	M5
(C)F-G10-*-20	124	108	81.8	90	245	225	169.5	140	32	1	22	89	M6

Sub Plate MF-06*-20



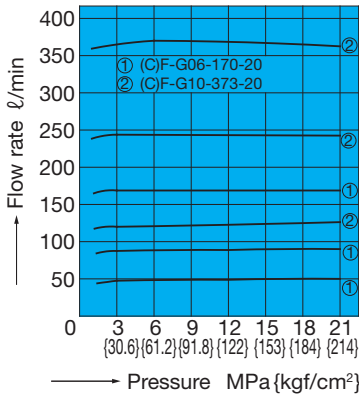
Sub Plate	Dimensions mm			
	R	S	T	U
MF-06-20	12.7	25	22	3/4
MF-06X-20	16	43	21	1



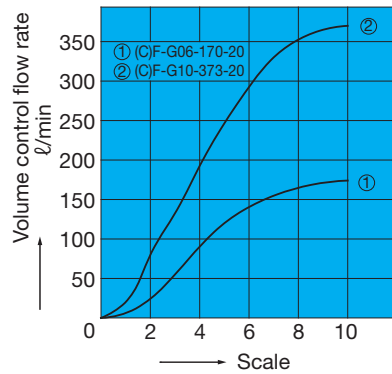
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

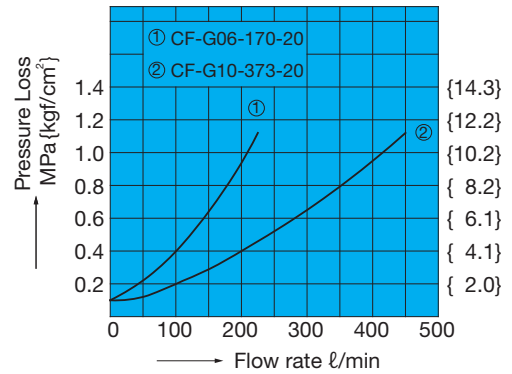
Pressure – Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

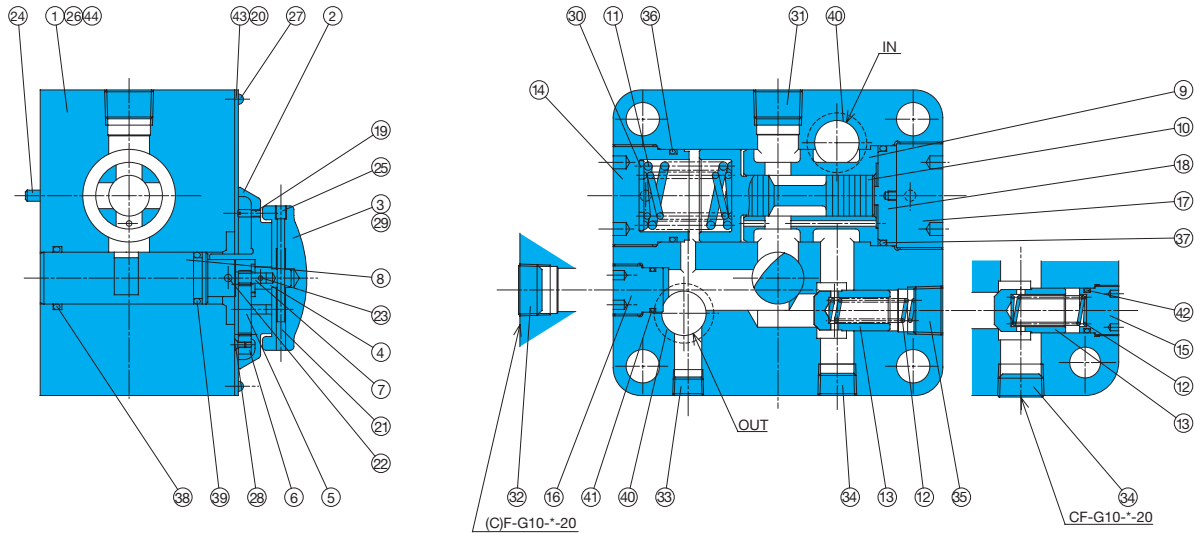


Pressure Loss Characteristics



Cross-sectional Drawing

CF-G**-*-20



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	16	Plug	31	Plug
2	Cover	17	Plug	32	Plug
3	Knob	18	Retainer	33	Plug
4	Gear	19	Stopper	34	Plug
5	Gear	20	Pin	35	Plug
6	Gear	21	Pin	36	O-ring
7	Bushing	22	Pin	37	O-ring
8	Throttle	23	Pin	38	O-ring
9	Sleeve	24	Pin	39	O-ring
10	Piston	25	Screw	40	O-ring
11	Spring	26	Screw	41	O-ring
12	Spring	27	Screw	42	O-ring
13	Poppet	28	Screw	43	Plate
14	Plug	29	Screw	44	Screw
15	Plug	30	Washer		

Seal Part List (Kit Model Number FBBS-***)

Part No.	Part Name	CF-G06-170-20		CF-G10-373-20	
		Part Number	Q'ty	Part Number	Q'ty
36	O-ring	NBR-90 G45	1	NBR-90 G60	1
37	O-ring	NBR-90 P48	1	NBR-90 G65	1
38	O-ring	NBR-90 P28	1	NBR-90 P45	1
39	O-ring	NBR-90 P22A	1	NBR-90 P39	1
40	O-ring	NBR-90 P29	2	NBR-90 P32	2
41	O-ring	NBR-90 P20	1	—	—
42	O-ring	—	—	NBR-90 P26	1

Note) The materials and hardness of the O-ring conforms with JIS B2401. For the *** part of the kit number, specify the valve size (G06, G10).



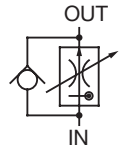
TN-G02-*-11



TN Type Flow Control (and Check) Valve (Fine Adjustment Type With Pressure and Temperature Compensation)

0.03 to 8ℓ/min
10.5MPa

CTN-G02-*-11



Features

- ① With a very compact, light-weight configuration, the intelligent design of this valve makes it a low-cost option.
- ② Minute flow rate control from 30cm³.
- ③ Stable control of each setting flow rate, even as pressure and oil temperature are fluctuating.
- ④ Dial markings are proportional to flow rate for simple and accurate control flow rate adjustment.

Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Reverse Flow Rate ℓ/min	Cracking pressure MPa(kgf/cm ²)	Weight kg
(C)TN-G02-2-11 -8-11	1/4	0.03 to 2 0.05 to 8	10.5{107}	35	0.1{1.0}	2.2

● Handling

- ① In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
- ② In the pressure range of 1.0 to 10.5MPa {10.2 to 107kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
- ③ Note that flow rate fluctuation exceeds the rated flow rate fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- ④ When controlling flow rates that are less than 0.2ℓ/min, use with a filter that does not exceed 10μm.
- ⑤ Make sure that the pressure differential between the inlet port and outlet is at least 0.6MPa {6.1kgf/cm²} at 4ℓ/min or less, and at least 1.0MPa {10.2kgf/cm²} at 4ℓ/min or greater.
- ⑥ The control flow rate is increased by clockwise (rightward) rotation of the adjustment handle.
- ⑦ For connection to piping, normally connect to the sub plate. Valve mounting is gasket type, using an O-ring. When a screw in connection is required, seal the gasket surface, remove the side plug, and create a screw in connection directly to the valve unit. In this case, remove all seal material affixed to the plug.
- ⑧ Use the following table for specification when a sub plate is required.

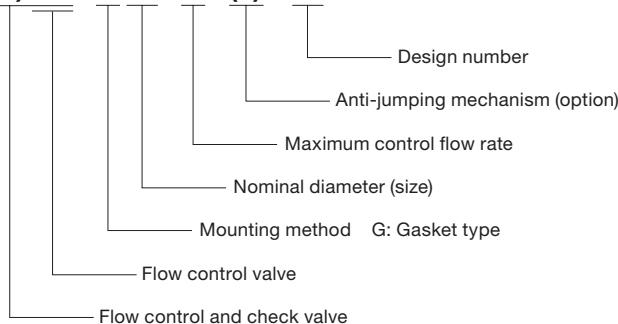
Model No	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg
MTL-03-10	3/8	35	1.3

- ⑨ Bundled Accessories: Hex Socket Bolts M8 x 60ℓ, (four)

Note) 1. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
2. Tightening torque is 20 to 25N·m {205 to 255kgf·cm}.

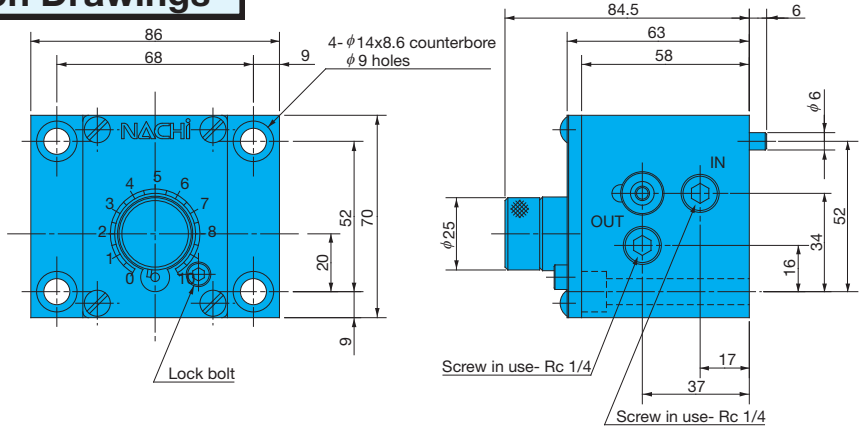
Explanation of model No.

(C) TN - G 02 - 2 - (F) - 11

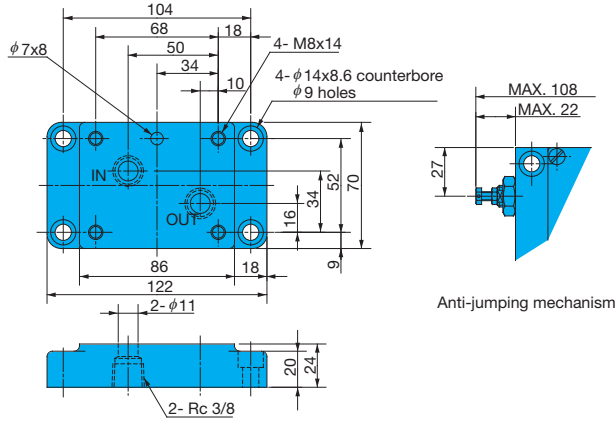


Installation Dimension Drawings

(C)TN-G02-**-11



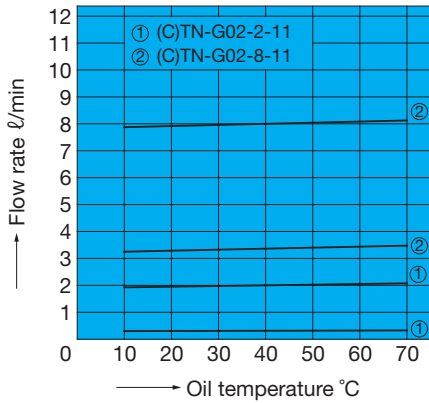
Sub Plate MTL-03-10



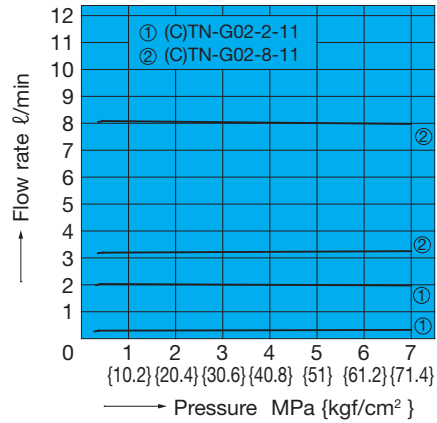
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

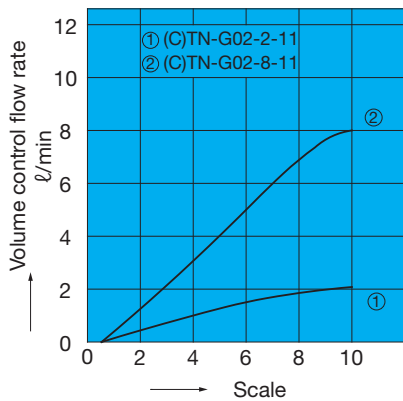
Oil Temperature – Control Flow Rate Characteristics



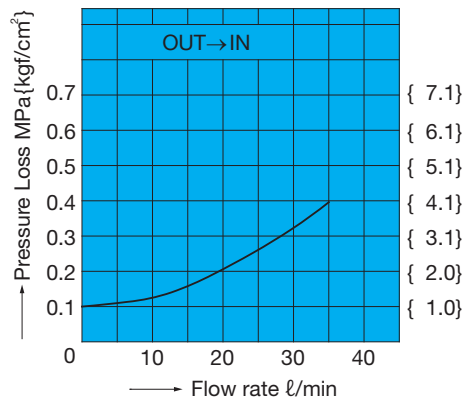
Pressure – Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

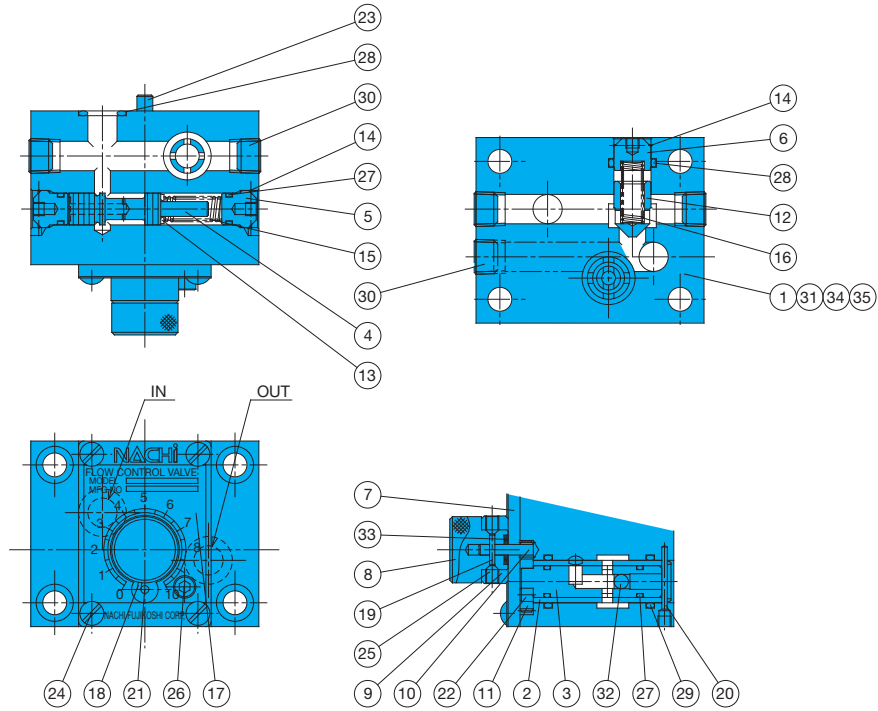


Pressure Loss Characteristics



Cross-sectional Drawings

CTN-G02-*-11



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	13	Spacer	25	Screw
2	Sleeve	14	Snap ring	26	Screw
3	Spool	15	Spring	27	O-ring
4	Piston	16	Spring	28	O-ring
5	Plug	17	Plate	29	O-ring
6	Plug	18	Pin	30	Plug
7	Plate	19	Pin	31	Ball
8	Knob	20	Pin	32	Ball
9	Ring	21	Pin	33	Washer
10	Gear	22	Pin	34	Screw
11	Gear	23	Pin	35	Plate
12	Poppet	24	Screw		

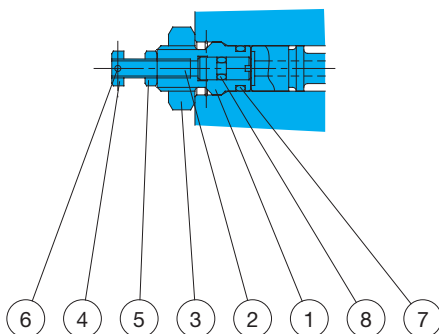
Seal Part List (Kit Model Number FNS-G02(C))

Part No.	Part Name	TN-G02-*-11		CTN-G02-*-11	
		Part Number	Q'ty	Part Number	Q'ty
27	O-ring	NBR-70-1 P9	4	NBR-70-1 P9	4
28	O-ring	NBR-70-1 P14	2	NBR-70-1 P14	3
29	O-ring	NBR-70-1 P16	2	NBR-70-1 P16	2

Note) Specify C at the end of the model number for the CTN kit.

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Anti-jumping mechanism (C)TN-G02-*-F-11



Part No.	Part Name
1	Retainer
2	Bolt
3	Nut
4	Nut
5	Nut
6	Spring pin
7	O-ring
8	O-ring

Seal Part List

Part No.	Part Name	Part Number	Q'ty
7	O-ring	NBR-70-1 P9	1
8	O-ring	NBR-70-1 P3	1

Note) Part number 7 O-ring and part number 27 O-ring are interchangeable.



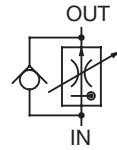
TS-G01-2-11



TS Type Flow Control (and Check) Valve (Fine Adjustment Type With Pressure and Temperature Compensation)

0.01 to 2ℓ/min
10.5MPa

CTS-G01-2-11



Features

- ① Original compact, lightweight configuration.
- ② High-precision control up to minute flow rates of 10cm³.
- ③ Design allows large 20ℓ/min reverse flow rate relative to control flow rate,
- ④ Stable control of each setting flow rate, even as pressure and oil temperature are fluctuating.

Specifications

Model No.	Nominal Diameter (Size)	Volume control flow rate ℓ/min	Maximum Working Pressure MPa{kgf/cm ² }	Reverse Flow Rate ℓ/min	Cracking pressure MPa{kgf/cm ² }	Weight kg
(C)TS-G01-2-11	1/8	0.01 to 2	10.5{107}	20	0.08{0.8}	0.9

● Handling

- ① In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
- ② In the pressure range of 0.6 to 10.5MPa {6.1 to 107kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
- ③ Note that flow rate fluctuation exceeds the rated fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- ④ When controlling flow rates that are less than 0.2ℓ/min, use with a line filter no greater than 10μm.
- ⑤ For flow rate control, make sure that the pressure differential between the input port and output port is at least 0.6MPa {6.1kgf/cm²}.
- ⑥ The control flow rate is increased by clockwise (rightward) rotation of the control handle.
- ⑦ Use the table to the right for specification when a sub plate is required.

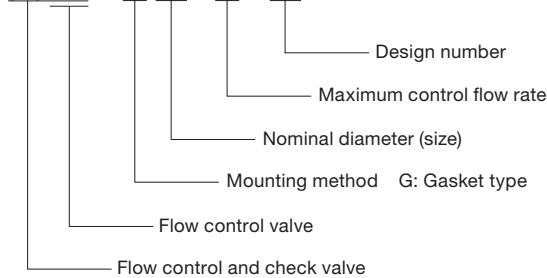
Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg
MTS-01Y-10	3/8	20	0.8

⑧ Bundled Accessories: Hex Socket Bolts: M4 x 35ℓ (four)

Note) 1. For mounting bolts, use bolts of 12.9 strength classification or equivalent.
2. Tightening torque is 2.6 to 3.3N·m {27 to 255kgf·cm}.

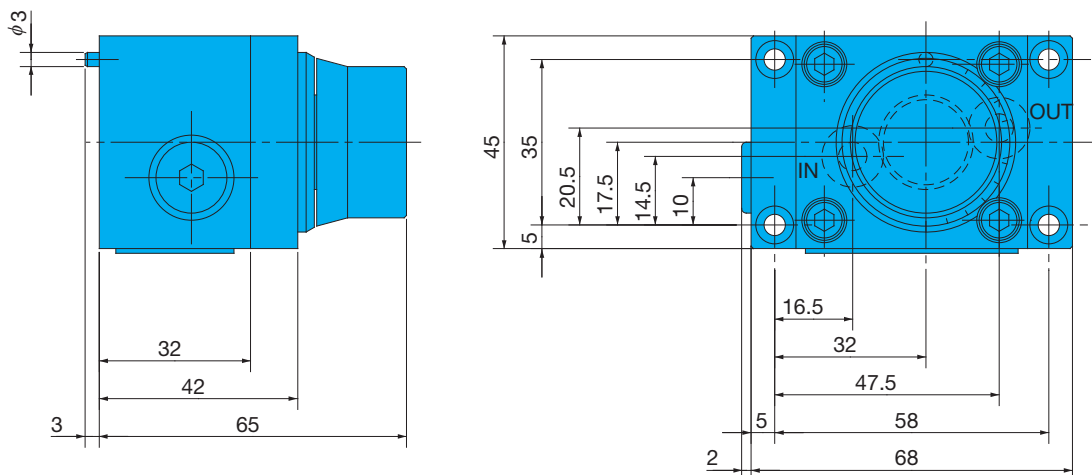
Explanation of model No.

(C) TS - G 01 - 2 - 11

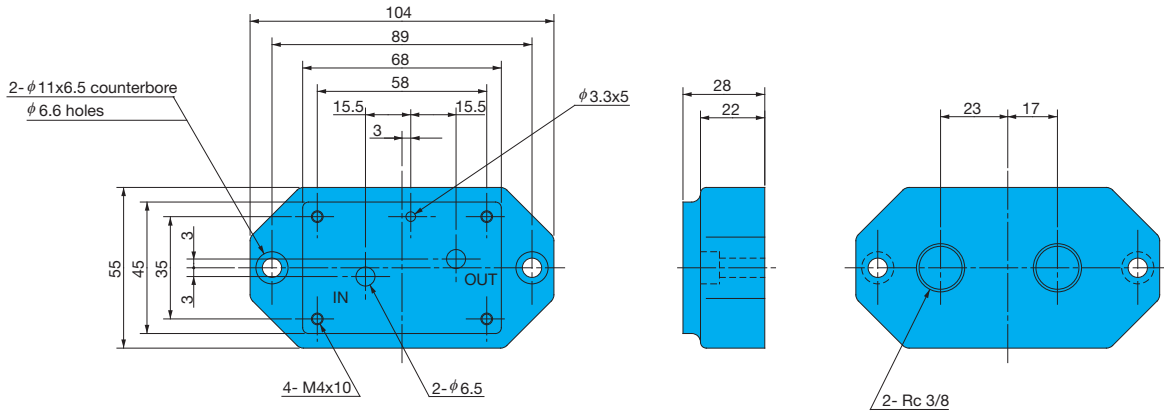


Installation Dimension Drawings

(C)TS-G01-2-11



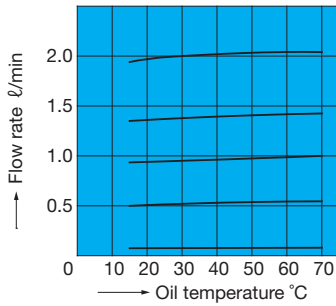
Sub Plate MTS-01Y-10



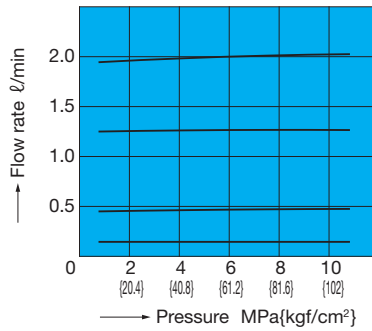
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

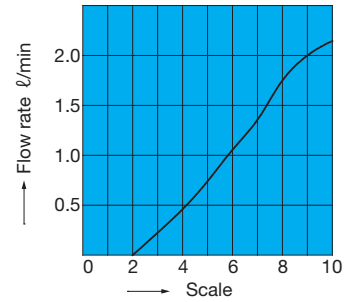
Oil Temperature – Control Flow Rate Characteristics



Pressure – Control Flow Rate Characteristics

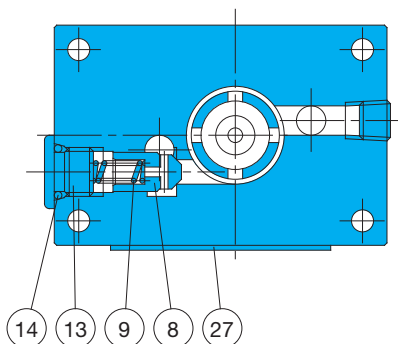
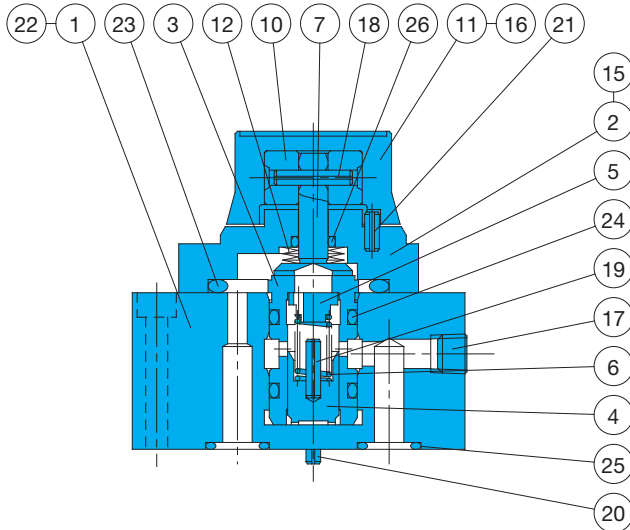


Scale – Control Flow Rate Characteristics

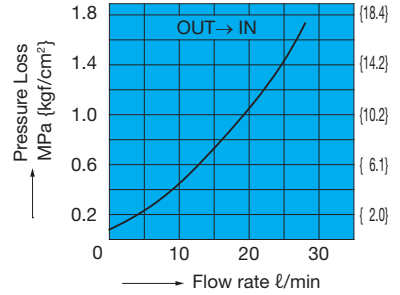


Cross-sectional Drawing

CTS-G01-2-11



Pressure Loss Characteristics



Part No.	Part Name	Part No.	Part Name
1	Body	14	O-ring
2	Cover	15	Screw
3	Sleeve	16	Screw
4	Piston	17	Plug
5	Guide	18	Spring pin
6	Spring	19	Spring pin
7	Throttle	20	Spring pin
8	Poppet	21	Spring pin
9	Spring	22	Spring pin
10	Spacer	23	O-ring
11	Knob	24	O-ring
12	Spring	25	O-ring
13	Plug	26	O-ring
		27	Nameplate

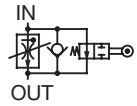
Seal Part List (Kit Model Number FKS-G01(C))

Part No.	Part Name	TS-G01-2-11		CTS-G01-2-11	
		Part Number	Q'ty	Part Number	Q'ty
14	O-ring	—	—	NBR-90 P8	1
23	O-ring	NBR-90 P31	1	NBR-90 P31	1
24	O-ring	NBR-90 P14	2	NBR-90 P14	2
25	O-ring	NBR-90 P10	2	NBR-90 P10	2
26	O-ring	NBR-90 P6	1	NBR-90 P6	1

Note) The materials and hardness of the O-ring conforms with JIS B2401. Specify C at the end of the model number for the CTS kit.



TL-G0*-*-11

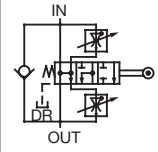


Note: 04 has DR

TL (TLT) Type Feed Control Valve (Fine Control Type With Pressure Compensation)

0.08 to 8ℓ/min
7MPa

TLT-G04*-*-11



Features

- ① Very compact, lightweight, and economically priced.
- ② Applicable for control of machine tool table operations.
For example, a single valve provides smooth control of: Fast Feed => Cutting Feed (2 stage) => Fast Return.
- ③ Stable control of each setting flow rate, even as pressure and oil temperature are fluctuating.
- ④ Dial markings are proportional to flow rate for simple control flow rate adjustment.
- ⑤ Sealing the gasket surface allows as-is screw-in connection.

Specifications

Model No	Nominal Diameter (Size)	Volume control flow rate ℓ/min		Reverse Flow Rate ℓ/min	Maximum Working Pressure MPa(kgf/cm ²)	Cracking pressure MPa(kgf/cm ²)	Weight kg
		Feed 1	Feed 2				
TL-G03-2-11 8-11	3/8	0.08 to 2 0.1 to 8	—	35	7{71.4}	0.1{1.0}	2.2
TL-G04-2-11 8-11	1/2	0.08 to 2 0.1 to 8	—	53			7.0
TLT-G04-2-1.5-11 8-2-11		0.1 to 2 0.1 to 8	0.1 to 1.5 0.1 to 2				

● Handling

- ① In the temperature range of 20°C to 60°C, flow rate fluctuation is within ±5% of the standard flow rate at 40°C.
- ② In the pressure range of 1.0 to 7.0MPa {10.2 to 71.4kgf/cm²}, flow rate fluctuation is within ±5% of the setting flow rate.
- ③ Note that flow rate fluctuation exceeds the rated fluctuation amount slightly in the vicinity of the minimum control flow rate, due to changes in operating temperature and hydraulic fluid viscosity.
- ④ When controlling flow rates that are less than 0.2ℓ/min, use with a line filter no greater than 10μm.
- ⑤ Make sure that the pressure differential between the inlet port and outlet is at least 0.6MPa {6.1kgf/cm²} at 4ℓ/min or less, and at least 1.0MPa {10.2kgf/cm²} at 4ℓ/min or greater.
- ⑥ The control flow rate is increased by clockwise (rightward) rotation of the control handle.
- ⑦ For connection to piping, normally connect to the sub plate. Valve mounting is gasket type, using an O-ring. When a screw in connection is required, seal the gasket surface, remove the side plug, and create a screw in connection directly to the valve unit. In this case, remove all seal material affixed to the plug.
- ⑧ See the table below for installation hex socket bolts.
- ⑨ Use the table to the right for specification when a sub plate is required.
- ⑩ G03 does not require drain pipe connection. G04 requires drain pipe connection.

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Applicable Valve Type
MTL-03-10	3/8	35	TL-G03*-*-11
MTL-04-10	1/2	53	TL(T)-G04*-*-11

⑪ Cam Down Force

TL-G03-11

Cam Down Force

120N {12.2kgf} minimum

TLT-G04*-*-11

Feed 1 Cam Down Force

140N {14.3kgf} minimum

Feed 2 Cam Down Force

200N {20.4kgf} minimum

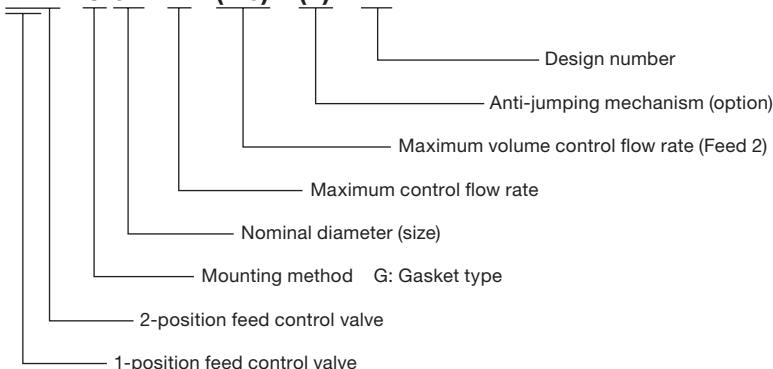
⑫ Make the cam angle no greater than 30 degrees.

Applicable Model	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
TL-G03*-*-11	M8 × 60ℓ	4	20 to 25{205 to 255}
TL(T)-G04*-*-11	M10 × 75ℓ	4	45 to 55{460 to 560}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

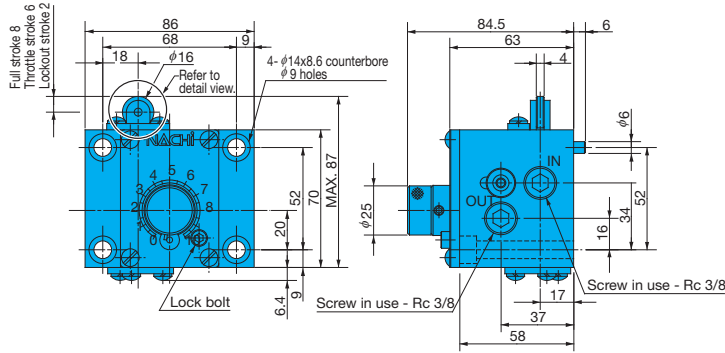
Explanation of model No.

TLT - G 04 - 2 - (1.5) - (F) - 11

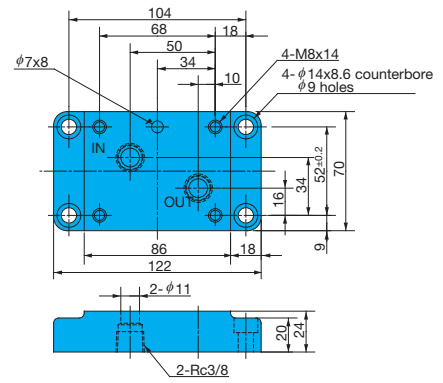


Installation Dimension Drawings

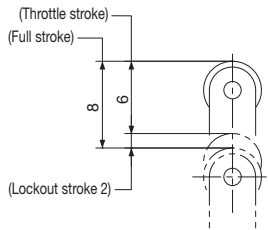
TL-G03-* -11



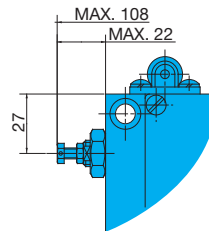
Sub Plate MTL-03-10



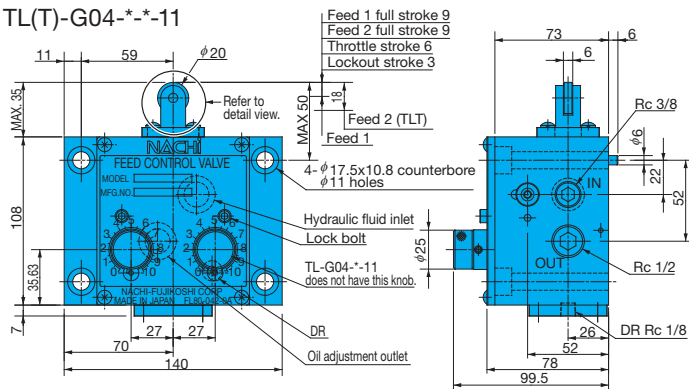
Roller operation range detail view G03



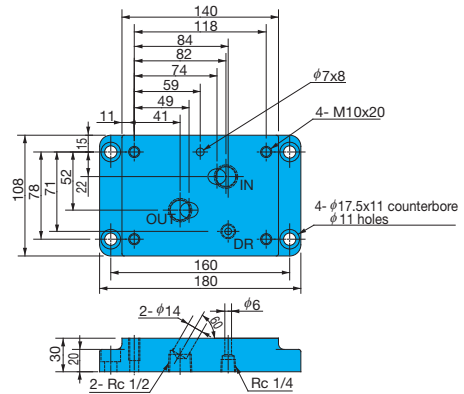
Anti-jumping Mechanism TL-G03-* -F-11



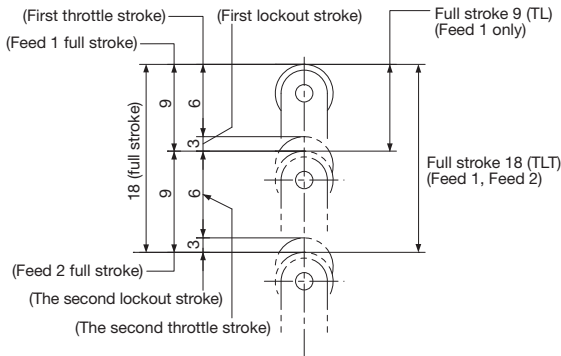
TL(T)-G04-* -11



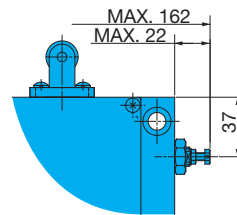
Sub Plate MTL-04-10



Roller operation range detail view G04



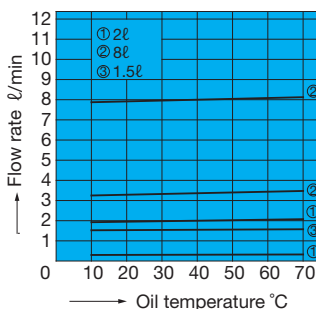
TL(T)-G04-* -F-11



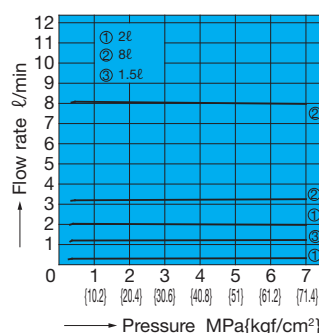
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

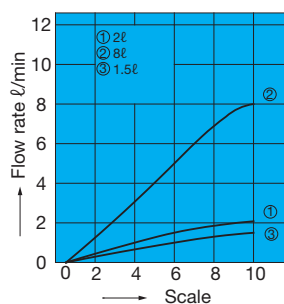
Oil Temperature – Control Flow Rate Characteristics



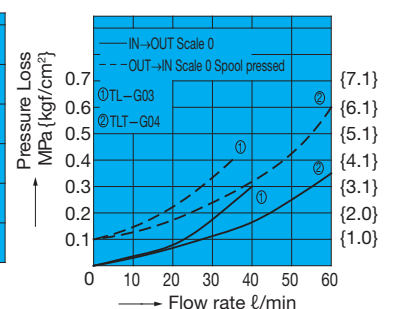
Pressure – Control Flow Rate Characteristics



Scale – Control Flow Rate Characteristics

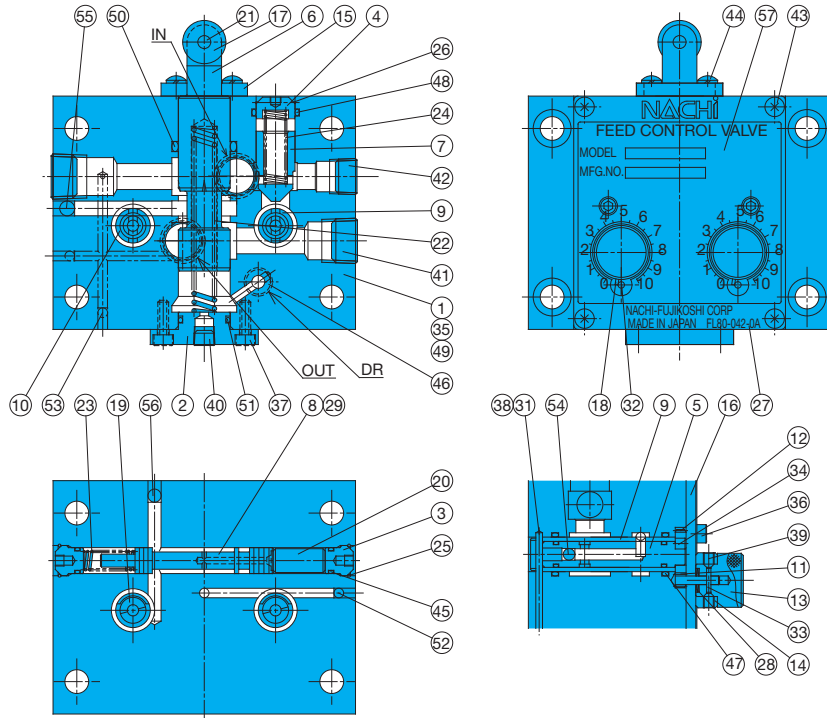


Pressure Loss Characteristics



Cross-sectional Drawings

TLT-G04-*-*-11

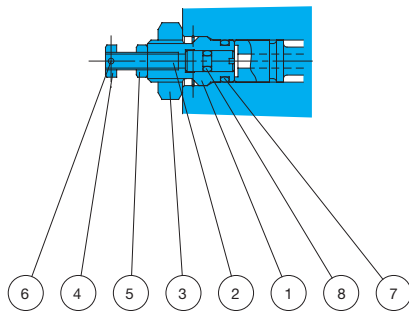


Note) The drawings on the left are TLT cross sections. In the case of TL, there is no knob on the right side.

Anti-jumping mechanism

TL-G03-*-F-11

TL(T)-G04-*-*-F-11



Part No. | Part Name

1	Retainer
2	Bolt
3	Nut
4	Nut
5	Nut
6	Spring pin
7	O-ring
8	O-ring

Seal Part List

Part No.	Part Name	Part Number	Q'ty
7	O-ring	NBR-70-1 P9	1
8	O-ring	NBR-70-1 P3	1

Note) 1. Part number 7 O-ring and part number 45 O-ring are interchangeable.
2. The materials and hardness of the O-ring conforms with JIS B2401.

Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	20	Spacer	39	Screw
2	Cover	21	Pin	40	Plug
3	Plug	22	Spring	41	Plug
4	Plug	23	Spring	42	Plug
5	Throttle	24	Spring	43	Screw
6	Spool	25	Snap ring	44	Screw
7	Poppet	26	Snap ring	45	O-ring
8	Piston	27	Plate	46	O-ring
9	Sleeve	28	Washer	47	O-ring
10	Sleeve	29	Pin	48	O-ring
11	Gear	30	Pin	49	O-ring
12	Gear	31	Pin	50	O-ring
13	Knob	32	Pin	51	O-ring
14	Ring	33	Pin	52	Ball
15	Stopper	34	Pin	53	Ball
16	Plate	35	Pin	54	Ball
17	Roller	36	Screw	55	Ball
18	Pin	37	Screw	56	Ball
19	Spacer	38	Screw	57	Plate

Seal Part List (Kit Model Number FLS-***(2))

Part No.	Part Name	TL-G03-*-11		TL-G04-*-11		TLT-G04-*-*-11	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
45	O-ring	NBR-70-1 P9	4	NBR-70-1 P9	4	NBR-70-1 P9	6
46	O-ring	—	—	NBR-70-1 P10	1	NBR-70-1 P10	1
47	O-ring	NBR-70-1 P16	2	NBR-70-1 P16	2	NBR-70-1 P16	4
48	O-ring	NBR-70-1 P14	1	NBR-70-1 P18	1	NBR-70-1 P18	1
49	O-ring	NBR-70-1 P14	2	NBR-70-1 P20	2	NBR-70-1 P20	2
50	O-ring	NBR-70-1 P18	2	NBR-70-1 P24	1	NBR-70-1 P24	1
51	O-ring	—	—	NBR-70-1 P20	1	NBR-70-1 P20	1

Note) 1. *** in the kit number is used for specification of the valve size. To specify TLT, add 2 to the end.
2. The materials and hardness of the O-ring conforms with JIS B2401.





Right Angle Check Valve In-line Check Valve

320ℓ/min
21MPa

Features

- ① The right angle type check valve changes the flow direction of fluid 90 degrees, while the in-line check valve allows only axial direction flow.
- ② The cracking pressures of these valves are fixed, so fluid passes freely in one direction, but is restricted from flowing in the opposite direction.

Specifications

	Model No.		Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Cracking Pressure MPa(kgf/cm ²)	Weight kg	
	Screw Mounting	Gasket Mounting					T Type	G Type
Right Angle Check Valve	CA-T03-1-20 2 3	CA-G03-1-20 2 3	3/8	21 {214}	40	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	1.0	1.8
	CA-T06-1-20 2 3	CA-G06-1-20 2 3	3/4		110	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.2	3.9
	CA-T10-1-20 2 3	CA-G10-1-20 2 3	1 1/4		320	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	4.0	6.1
In-line Check Valve	CN-T03-1-11 2 3	-	3/8		30	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	0.4	-
	CN-T06-1-11 2 3		3/4		75	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	0.7	
	CN-T10-1-11 2 3		1 1/4		190	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	2.2	

● Handling

- ① Use the following table for specification when a sub plate is required.
- ② The following are the bundled mounting bolts.

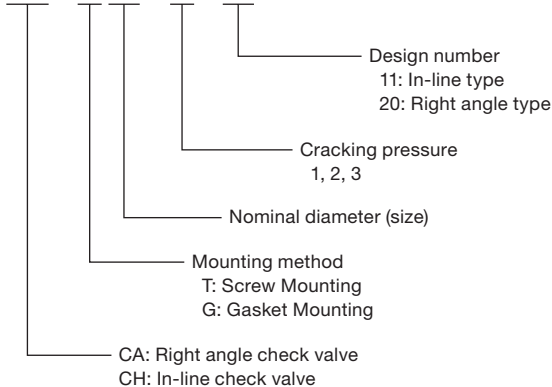
Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type
MCA-03-20	3/8	40	1.4	CA-G03-* -20
MCA-06-21	3/4	110	3.5	CA-G06-* -20
MCA-10-20	1 1/4	320	6.1	CA-G10-* -20

Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
CA-G03-* -20	M8×45ℓ	4	20 to 25 {205 to 255}
CA-G06-* -20	M16×65ℓ	4	190 to 235 {1940 to 2400}
CA-G10-* -20	M20×75ℓ	4	370 to 460 {3770 to 4690}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.

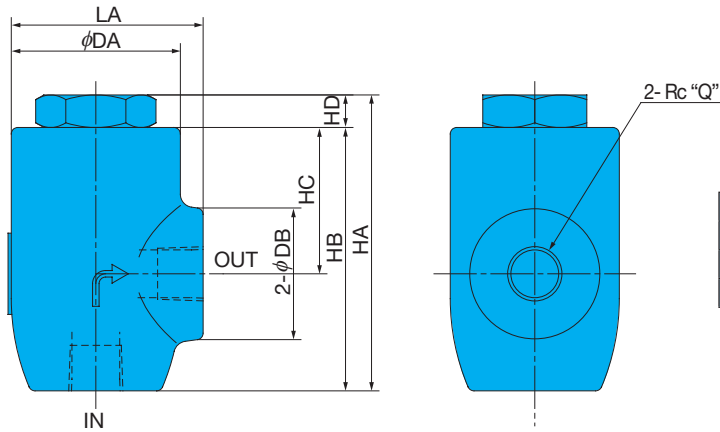
Explanation of model No.

CA - T 03 - 1 - 20



Installation Dimension Drawings

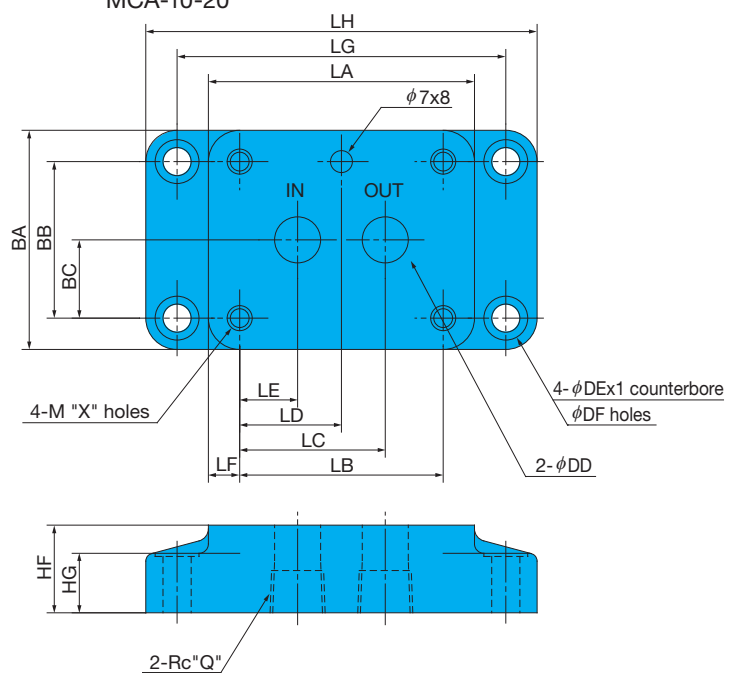
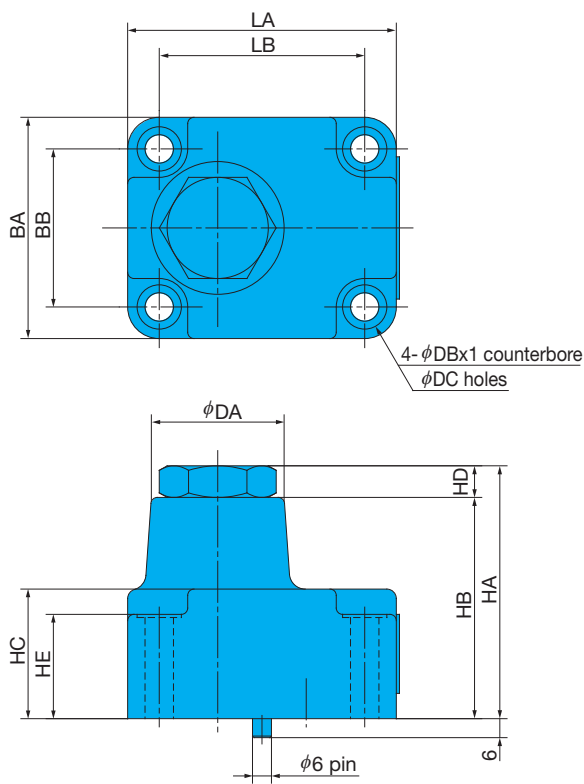
CA-T**-20 (Screw Mounting)



Model No.	LA	HA	HB	HC	HD	DA	DB	Q
CA-T03-*-20	59	91	81	45	10	52	40	3/8
CA-T06-*-20	72	106	96	55	10	60	45	3/4
CA-T10-*-20	96	139	127	70	12	80	62	1¼

CA-G**-20 (Gasket Mounting)

Sub Plate
MCA-03-20
MCA-06-21
MCA-10-20

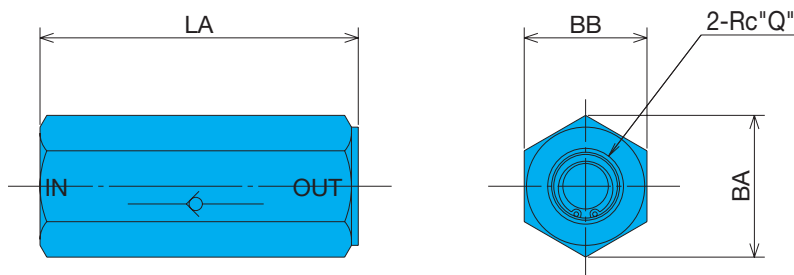


Note) External appearance of the sub-plate is slightly different from the drawing depending on the size.

DC	DD	DE	DF	Q	X
9	14.7	14	9	3/8	8
17	23	20	14	3/4	16
22	30	20	14	1¼	20

Model No.	LA	LB	LC	LD	LE	LF	LG	LH	BA	BB	BC	HA	HB	HC	HD	HE	HF	HG	DA	DB
CA-G03-*-20	86	65	46.5	32.5	18.5	10.5	105	125	71	50	25	80	70	41	10	33	28	19	42	14
CA-G06-*-20	117	81	68.2	40.5	22.2	18	140	172	101	65	32.5	98	88	58	10	43	31	19	52	26
CA-G10-*-20	133	92	71.4	46	20.6	20.5	152	187	133	92	46	119	107	65	12	46	40	28	68	32

CN-T**-11 (Screw Mounting)



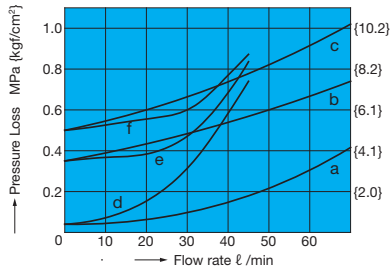
Model No.	LA	BA	BB	D
CN-T03-*-11	70	31.2	27	3/8
CN-T06-*-11	95	43.9	38	3/4
CN-T10-*-11	130	69.3	60	1¼

Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

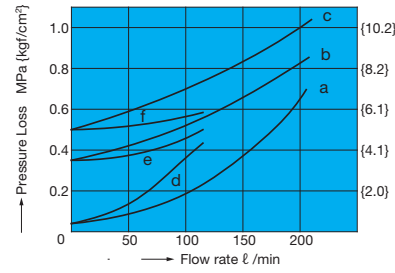
CA-*03 CN-T03



Applicable Valve Type

- a. CA-*03-1-20
- b. CA-*03-2-20
- c. CA-*03-3-20
- d. CN-T03-1-11
- e. CN-T03-2-11
- f. CN-T03-3-11

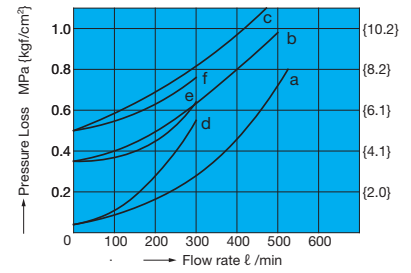
CA-*06 CN-T06



Applicable Valve Type

- a. CA-*06-1-20
- b. CA-*06-2-20
- c. CA-*06-3-20
- d. CN-T06-1-11
- e. CN-T06-2-11
- f. CN-T06-3-11

CA-*10 CN-T10

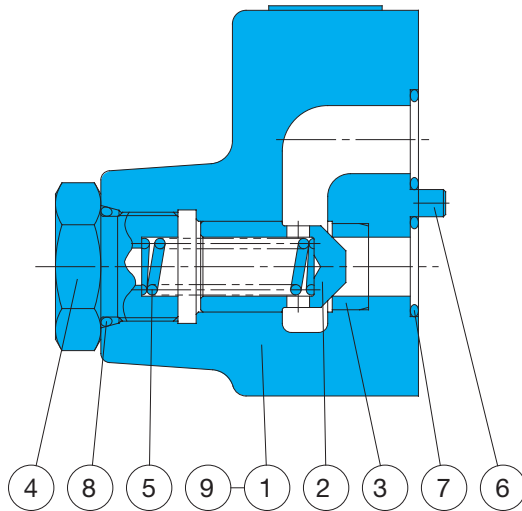


Applicable Valve Type

- a. CA-*10-1-20
- b. CA-*10-2-20
- c. CA-*10-3-20
- d. CN-T10-1-11
- e. CN-T10-2-11
- f. CN-T10-3-11

Cross-sectional Drawing

CA-G**-*-20



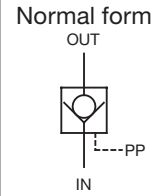
Part No.	Part Name
1	Body
2	Poppet
3	Seat
4	Plug
5	Spring
6	Pin
7	O-ring
8	O-ring
9	Nameplate

Seal Part List (Kit Model Number DAS-***)

Part No.	Part Name	Type/Part Number			Q'ty
		CA-G03	CA-G06	CA-G10	
7	O-ring	NBR-90 P18	NBR-90 G30	NBR-90 G40	2
8	O-ring	NBR-90 P22	NBR-90 P30	NBR-90 P42	1

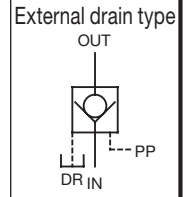
Note) The materials and hardness of the O-ring conforms with JIS B2401.

*** in the kit number is used for specification of the valve size (G03, G06, G10, etc.)



Pilot Check Valves

320ℓ/min
21MPa



Features

- ① Normally, fluid is allowed to flow in a single direction, just as with a standard check valve. Reverse flow can be enabled, however, when the check valve is pushed upwards by external pilot pressure.
- ② Very compact configuration.

Specifications

Model No		Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min	Cracking Pressure MPa{kgf/cm ² }	Weight kg		Area Ratio		
Screw Mounting	Gasket Mounting					T Type	G Type	Pilot Piston	Valve	Small Valve
CP-T03-1-* 2	CP-G03-1-* 2	3/8	21 {214}	40	0.2 {2.0} 0.5 {5.1}	3.8 (4.7)	4.3 (5.2)	1	0.35	0.05
CP-T06-1-* 2	CP-G06-1-* 2	3/4		110	0.2 {2.0} 0.5 {5.1}	7.0 (8.2)	6.6 (7.8)	1	0.37	0.03
CP-T10-1-* 2	CP-G10-1-* 2	1¼		320	0.2 {2.0} 0.5 {5.1}	12.0 (14.3)	12.5 (14.8)	1	0.36	0.03

Note) Weight values in parentheses are for the external drain type.

● Handling

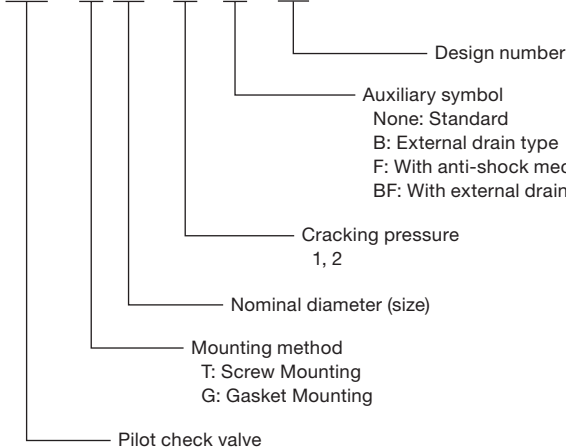
- ① The following explains how to use the external drain. Be sure to always use the external drain type when back pressure is applied to fluid outlet port side A during reverse flow as in the circuit illustrated below.
- ② Minimum pilot pressure is altered by input side B pressure during reverse flow. Because of this, operate the valve so pressure is at least twice as high as the required pilot pressure obtained using the minimum pilot pressure characteristics.
- ③ Use the following table for specification when a sub plate is required.

Model No.	Pipe Diameter	Recommended Flow Rate ℓ/min	Weight kg	Applicable Valve Type
MCP-03-20	3/8	40	1.1	CP-G03-* -20
MCP-06-21	3/4	110	1.7	CP-G06-* -20
MCP-10-20	1¼	320	3.6	CP-G10-* -20

- ④ The following are the bundled mounting bolts.

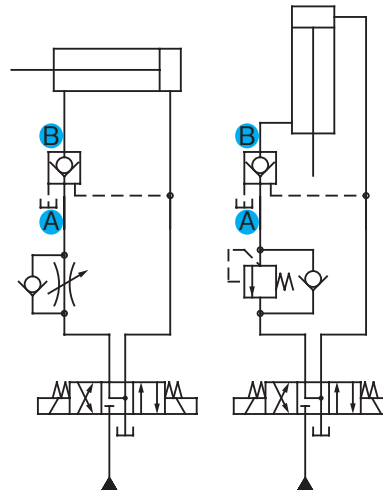
Explanation of model No.

CP - G 03 - 1 - B - 20



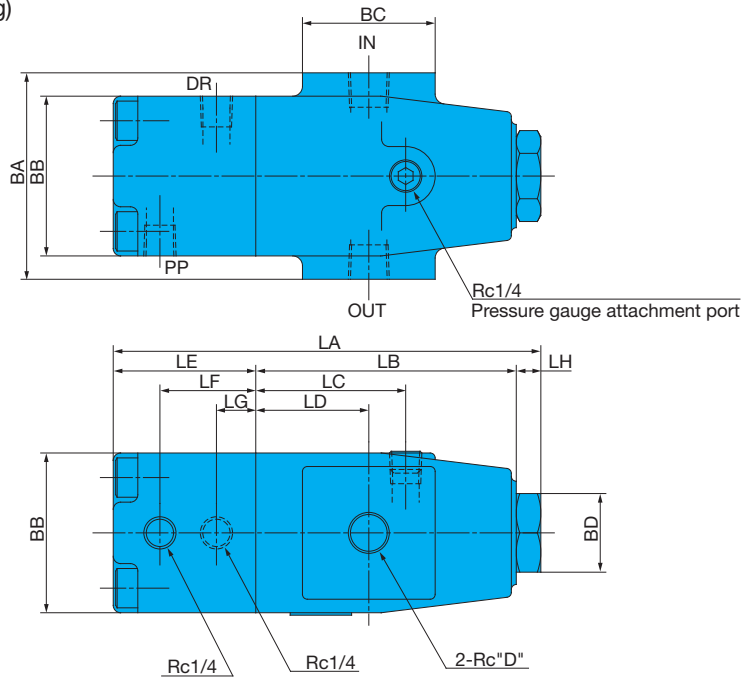
Model No.	Bolt Dimensions	Q'ty	Tightening Torque N·m(kgf·cm)
CP-G03-* -20	M8×45ℓ	4	20 to 25 {205 to 255}
-G06-	M10×55ℓ	4	45 to 55 {460 to 560}
-G10-	M10×65ℓ	6	45 to 55 {460 to 560}

Note) For mounting bolts, use bolts of 12.9 strength classification or equivalent.



Installation Dimension Drawings

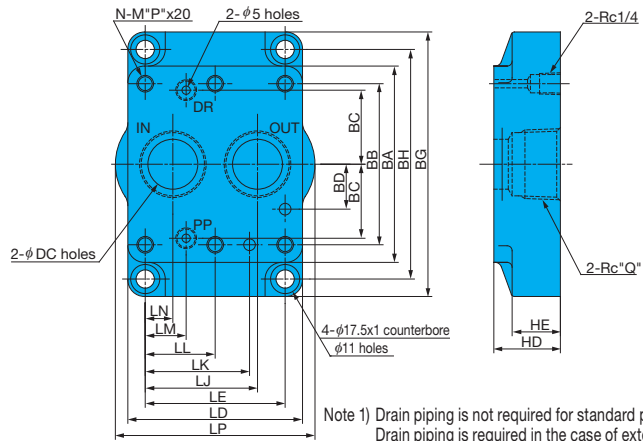
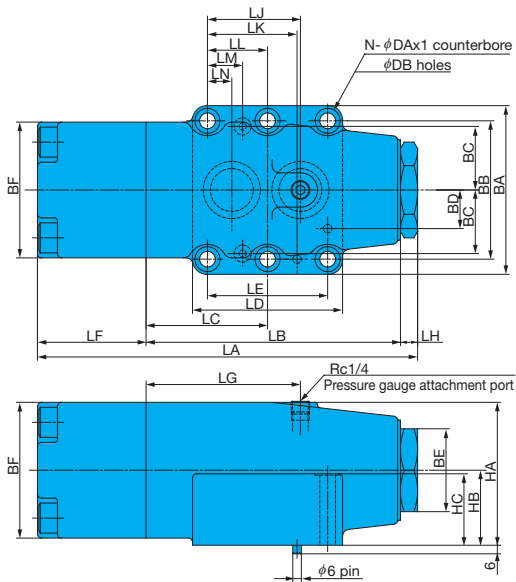
CP-T**-*-20 (Screw Mounting)



Model No.	LA	LB	LC	LD	LE	LF	LG	LH	BA	BB	BC	BD	D
CP-T03-*(F)-20	146	106	61	46	30	15	-	10	84	65	54	32	3/8
CP-T03-*(B(F))-20	174				58	39	16						
CP-T06-*(F)-20	180	140	85	66	30	15	-	10	122	76	64	41	3/4
CP-T06-*(B(F))-20	212				62	43	16						
CP-T10-*(F)-20	225	178	108	85	35	15	-	12	150	95	85	58	1 1/4
CP-T10-*(B(F))-20	266				76	57	16						

CP-G**-*-20 (Gasket Mounting)

Sub Plate MCP-03-20
MCP-06-21
MCP-10-20



Note 1) Drain piping is not required for standard products.
Drain piping is required in the case of external drain type (B).
Note 2) External appearance of the sub-plate is slightly different from the drawing depending on the size.
Installation dimensions are as shown in the dimension tables.

BH	HA	HB	HC	HD	HE	DA	DB	DC	N	P	Q
106	68	35.5	33	30	19	14	9	14.7	4	8	3/8
124	79	41	38	30	19	17.5	11	22	4	10	3/4
138	100	52.5	50	40	29	17.5	11	30	6	10	1 1/4

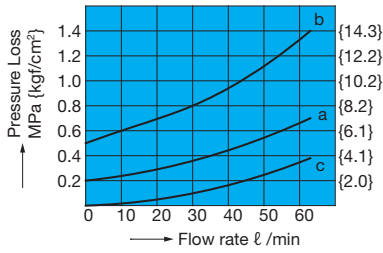
Model No.	LA	LB	LC	LD	LE	LF	LG	LH	LJ	LK	LL	LM	LN	LP	BA	BB	BC	BD	BE	BF	BG
CP-G03-*(F)-20	146	106	51	64	44	30	61	10	37	-	-	16	7	-	82	64	23	18	32	65	126
CP-G03-*(B(F))-20	174					58															
CP-G06-*(F)-20	180	140	66	83	60.3	30	85	10	49.2	44.5	-	20.6	11.1	-	102	79.4	33.3	-	41	76	146
CP-G06-*(B(F))-20	212					62															
CP-G10-*(F)-20	225	178	85	105	84.1	35	108	12	67.5	62.7	42.05	24.6	16.6	120	118	96.8	44.5	-	58	95	159
CP-G10-*(B(F))-20	266					76															

Performance Curves

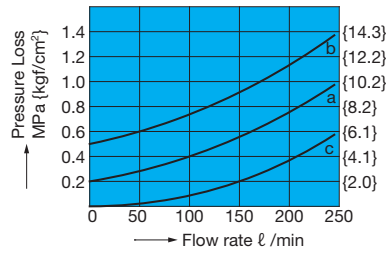
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Pressure Loss Characteristics

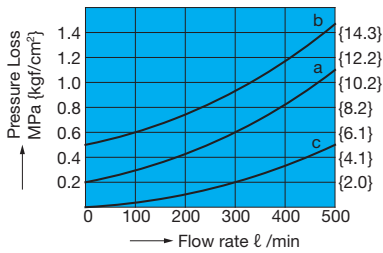
CP-*03 Applicable Valve Type
 a. CP-*03-1-* -20 Free Flow
 b. CP-*03-2-* -20 "
 c. CP-*03-*-* -20 Reverse Flow



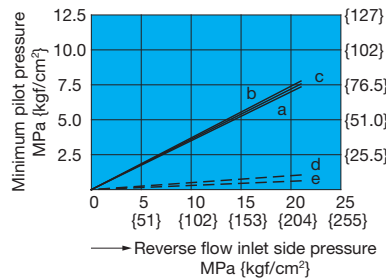
CP-*06 Applicable Valve Type
 a. CP-*06-1-* -20 Free Flow
 b. CP-*06-2-* -20 "
 c. CP-*06-*-* -20 Reverse Flow



CP-*10 Applicable Valve Type
 a. CP-*10-1-* -20 Free Flow
 b. CP-*10-2-* -20 "
 c. CP-*10-*-* -20 Reverse Flow



Minimum Pilot Pressure Characteristics



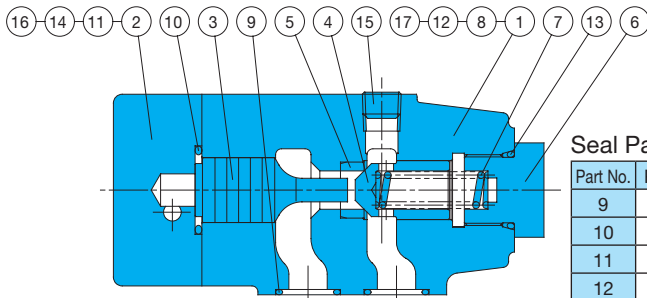
Applicable Valve

Model No.	Valve Open	Small Valve Open
CP-*03	a	d
CP-*06	b	e
CP-*10	c	e

Cross-sectional Drawings

Note) O-ring 1B-** refers to JIS B2401-1B-**.

CP-G**-* -20



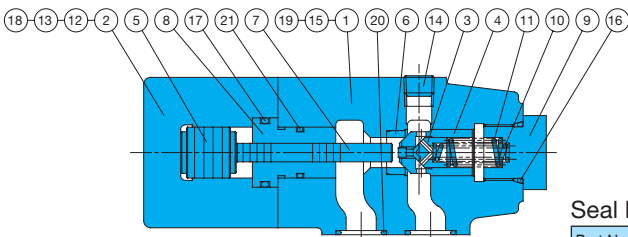
Part No.	Part Name	Part No.	Part Name
1	Body	10	O-ring
2	Cover	11	O-ring
3	Piston	12	O-ring
4	Poppet	13	O-ring
5	Seat	14	Screw
6	Plug	15	Plug
7	Spring	16	Plug
8	Pin	17	Plate
9	O-ring		

Seal Part List (Kit Model Number DPS-***)

Part No.	Part Name	CP-G03-* -20	CP-G06-* -20	CP-G10-* -20	Q'ty
9	O-ring	NBR-90 P18	NBR-90 G25	NBR-90 G35	2
10	O-ring	NBR-90 G25	NBR-90 G40	NBR-90 G55	1
11	O-ring	NBR-90 P7	NBR-90 P9	NBR-90 P9	2
12	O-ring	NBR-90 P9	NBR-90 P9	NBR-90 P9	2
13	O-ring	NBR-90 P22	NBR-90 P30	NBR-90 P42	1

***in the kit number is used for specification of the valve size.

CP-G**-* -BF-20



Part No.	Part Name	Part No.	Part Name	Part No.	Part Name
1	Body	9	Plug	17	O-ring
2	Cover	10	Spring	18	O-ring
3	Poppet	11	Spring	19	O-ring
4	Poppet	12	Screw	20	O-ring
5	Piston	13	Plug	21	O-ring
6	Seat	14	Plug	22	Plate
7	Rod	15	Pin		
8	Bushing	16	O-ring		

Seal Part List (Kit Model Number DPS-***R)

Part No.	Part Name	CP-G03-* -BF-20	CP-G06-* -BF-20	CP-G10-* -BF-20	Q'ty
16	O-ring	NBR-90 P22	NBR-90 P30	NBR-90 P42	1
17	O-ring	NBR-90 G25	NBR-90 G40	NBR-90 G55	1
18	O-ring	NBR-90 P7	NBR-90 P9	NBR-90 P9	2
19	O-ring	NBR-90 P9	NBR-90 P9	NBR-90 P9	2
20	O-ring	NBR-90 P18	NBR-90 G25	NBR-90 G35	2
21	O-ring	NBR-90 P18	NBR-90 P30	NBR-90 G45	1

***in the kit number is used for specification of the valve size.

Direction Control Valve



Gauge Cock

35MPa

Features

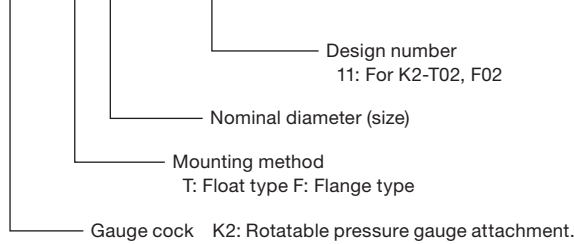
- ① Ultra-compact configuration requires minimal installation space.
- ② Intelligent design packs plenty of function into a simple configuration.
- ③ Maximum operating pressure of 35MPa{357kgf/cm²} allows operation across a wide range.

Specifications

Model No.		G "A" (Nominal Dimension)	B mm	C mm	Maximum Working Pressure MPa{kgf/cm ² }	Weight kg
Float Type	Flange Type					
K2-T02-11	K2-F02-11	G1/4	10	19	21 {214}	0.35
K2-T03-10	K2-F03-10	G3/8	16	23	35 {357}	
K2-T04-10	K2-F04-10	G1/2	16	26		

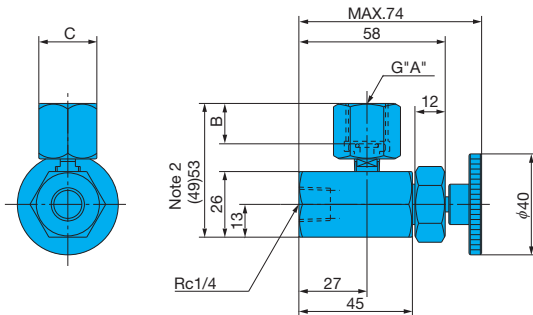
Explanation of model No.

K2 - T 02 - 10(11)

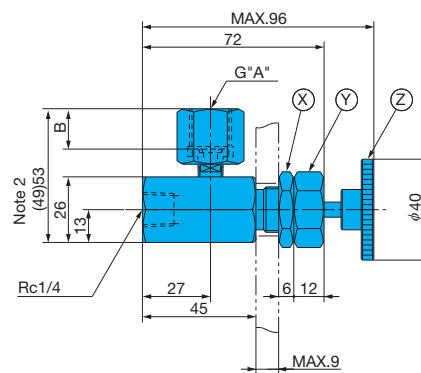


Installation Dimension Drawings

K2-T**-10 (11)



K2-F**-10 (11)



- Note) 1. Maximum iron plate thickness: 9t; Mounting Bolt Hole Diameter: φ20 When mounted to panel
Loosen the (X) lock nut and (Y) cap nut, and pull out the (Z) adjusting screw.
To return to its original position, reverse this process.
2. Dimensions in parentheses are for the 02 size.

3. For information about G "A" and B, see the specifications. The Oring shown below is used as a pressure gauge seal beneath screw G.
G1/4 JIS B2401-1B-P5
G3/8 JIS B2401-1B-P6
G1/2 JIS B2401-1B-P9



DMA Type Manual Valve

40 to 100ℓ/min
35MPa

Features

- ① The compact 01 and 03 sizes are perfect for small flow rate control.
- ② Since a balanced type valve is used, there is no need for drain piping, and use with back pressures up to 16MPa (163kgf/cm²) is possible.
- ③ Mounting methods are the same as SAG01/ 03, and the 01, 03 size modular valve can be used, so circuit configuration is quick and easy.

Specifications

Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa(kgf/cm ²)	Tank Port Back Pressure MPa(kgf/cm ²)	Maximum Flow Rate ℓ/min	Spool Stroke (mm)		Weight kg
					2-position	3-position	
DMA-G01-***-20	1/8	35(25) {357(255)}	16 {163}	40	4	4x2	1.3
DMA-G03-***-(J)20	3/8			100	6	6x2	3.3

Positions	Type	JIS Symbol	Model No.	Maximum Working Pressure MPa(kgf/cm ²)
2-position	Closed Cross		DMA-G01-A3X-20 G03-A3X-(J)20	35 {357}
	Open Cross		DMA-G01-A3Z-20 G03-A3Z-(J)20	
	Closed Cross		DMA-G01-E3X-20 G03-E3X-(J)20	
	Open Cross		DMA-G01-E3Z-20 G03-E3Z-(J)20	
3-position	All Ports Open		DMA-G01-C4-20 G03-C4-(J)20	
			DMA-G01-F4-20 G03-F4-(J)20	
			DMA-G01-C5-20 G03-C5-(J)20	
	All Ports Blocked		DMA-G01-F5-20 G03-F5-(J)20	
			DMA-G01-F6-20 G03-F6-(J)20	
	ABT Connection		DMA-G01-C6-20 G03-C6-(J)20	
			DMA-G01-F6-20 G03-F6-(J)20	
	PT Connection	Closed Cross		DMA-G01-C7X-20 G03-C7X-(J)20
		Restricted Open Cross		DMA-G01-C7Y-20 G03-C7Y-(J)20
		Closed Cross		DMA-G01-F7X-20 G03-F7X-(J)20
Restricted Open Cross			DMA-G01-F7Y-20 G03-F7Y-(J)20	
PAT Connection		DMA-G01-C8-20 G03-C8-(J)20	35 {357}	
		DMA-G01-F8-20 G03-F8-(J)20		

● Handling

① The following are the three types of lever operations.

① Spring Offset Type (Type A)

The lever is normally kept in the end position by the spring. Raising the lever performs switching, and the lever returns to its original position when released.

② Spring Center Type (Type C)

The spool is normally in the center of position 3. After switching to either end, the spring returns the lever to its center position when the lever is released.

③ Detent Type (Type F, Type E)

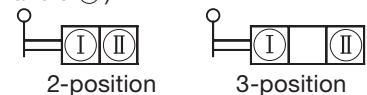
A notch at spool position 3 or position 2 acts as a stop.

② Pressure loss is the same as that for the SA-G01/ G03, so see SA-G01/ G03 for more information.

③ The lever mounting orientation can be positioned at 90° increments by changing the orientation of the lever side cover.

④ For PT connection type DMA-G01/ G03-7*(J)20, closed cross DMA-G01/ G03-7X-(J)20 is the standard type.

⑤ The relationship between the lever switching positions and JIS symbols is shown below. (See the installation dimension diagrams for symbols & ① and & ②.)



⑥ Mounting bolts are not included with the 01 size.

DMA-G01-***-20	M5x45ℓ	4
DMA-G03-***-J20	M6x70ℓ	4
DMA-G03-***-20	M8x70ℓ	4

Note) Use bolts of 12.9 strength classification or equivalent.

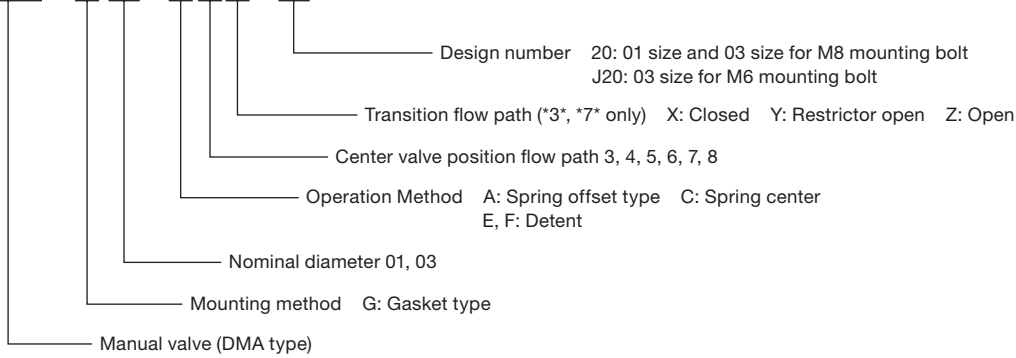
⑦ The following shows the sub plates.

Model No.	Pipe Diameter	Maximum Working Pressure MPa(kgf/cm ²)	Recommended Flow Rate (ℓ/min)	Weight (kg)	Applicable Valve Type
MSA-01Y-10	3/8	25 {255}	40	1.2	DMA-G01-***-20
MSA-03-10	3/8		45	2.3	DMA-G03-***-J20
MSA-03X-10	1/2		80	2.3	DMA-G03-***-20
MS-03-30	3/8		45		
MS-03X-30	1/2		80		

These sub plates can also be used with SA (SS)-G01/G03, so see SA (SS)-G01/G03 for mounting methods.

Explanation of model No.

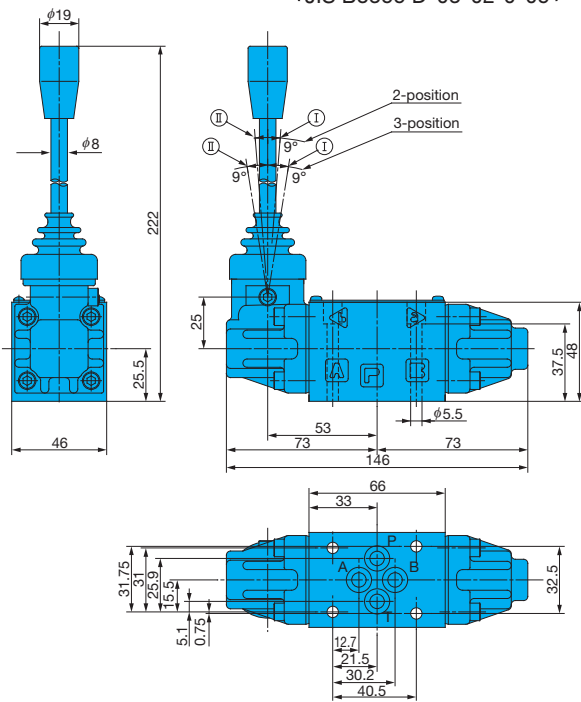
DMA - G 01 - A 3 X - 20



Installation Dimension Drawings

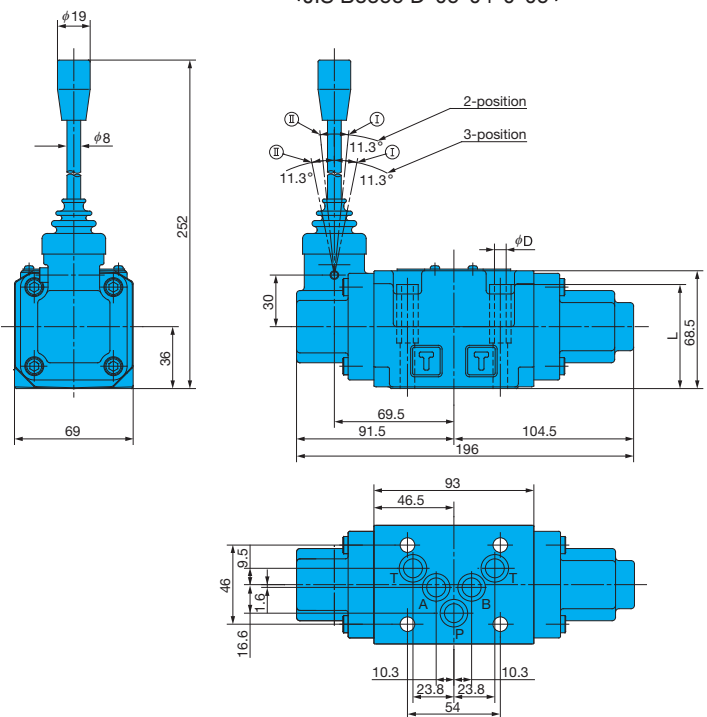
DMA-G01-***-20

Gasket Surface Dimensions (ISO 4401-03-02-0-05
JIS B8355 D-03-02-0-05)



DMA-G03-***-(J)20

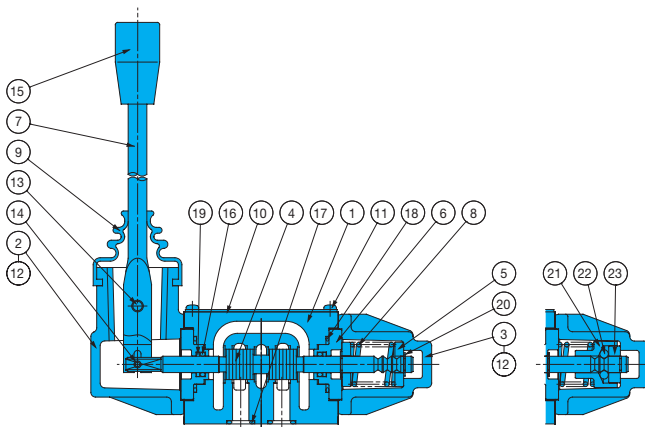
Gasket Surface Dimensions (ISO 4401-05-04-0-05
JIS B8355 D-05-04-0-05)



	DMA-G03-**-J20	DMA-G03-**-20
ϕD	$\phi 6.8$	$\phi 8.5$
L	60.5	58

Cross-sectional Drawing

DMA-G01-***-20

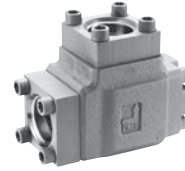


Part No.	Part Name	Part No.	Part Name
1	Body	13	Screw
2	Cover A	14	Pin
3	Cover B	15	Knob
4	Spool	16	O-ring
5	Ring	17	O-ring
6	Bush	18	O-ring
7	Lever	19	Backup ring
8	Spring	20	Snap ring
9	Rod cover	21	Guide
10	Nameplate	22	Ball
11	Stopper screw	23	Retainer
12	Screw		

Seal Part List

Part No.	Part Name	Model No.			
		DMA-G01	Q'ty	DMA-G03	Q'ty
16	O-ring	NBR-70-1 P7	2	NBR-70-1 P10	2
17	O-ring	AS568-012(NBR-90)	4	AS568-014(NBR-90)	5
18	O-ring	AS568-019(NBR-90)	2	NBR-90 P28	2
19	Backup ring	T2-P7	2	T2-P10	2

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. Backup ring indicates JIS B2407-T2-**.



Flange Type
Check Valve/Throttle Valve
Pilot Operated Check Valve

1300ℓ/min
25MPa

Features

① This series provides high capacity and flange connection, as well as compliance with new standards

and Japan Oil Hydraulic Standards (JOHS).

② Measurable higher pressure and higher capacity than previous models.

Specifications

Contact your agent for more information about mounting methods, etc.

	Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Rated flow rate ℓ/min	Cracking pressure MPa{kgf/cm ² }	Weight kg	Japan Fluid Power Association Standard Number
	Flange Mounting						
Right Angle Check Valve	CA-F06-1-30 2 3	3/4	25 {255}	125	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	3.8	JFPS1009
	CA-F10-1-30 2 3	1¼		300	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	7.5	
	CA-F16-1-30 2 3	2		600	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	20.1	
	CA-F24-1-30 2 3	3		1300	0.04 {0.4} 0.35 {3.6} 0.50 {5.1}	63	
Pilot Operated Check Valve	CP-F06-1-* 2	3/4	25 {255}	125	0.2 {2.0} 0.5 {5.1}	6.4	JFPS1010
	CP-F10-1-* 2	1¼		250	0.2 {2.0} 0.5 {5.1}	11.5	
	CP-F16-1-* 2	2		600	0.2 {2.0} 0.5 {5.1}	32	

	Model No.	Nominal Diameter (Size)	Maximum Working Pressure MPa{kgf/cm ² }	Rated flow rate ℓ/min	Cracking pressure MPa{kgf/cm ² }	Weight kg	Japan Fluid Power Association Standard Number
	Flange Mounting						
Slot Valve	(C)FR-F06-30	3/4	25 {255}	85	0.1 {1.0}	4.7	JFPS1012
	(C)FR-F10-30	1¼		230		11.0	
	(C)FR-F16-30	2		500		21.5	



Electro-hydraulic Proportional Valve Series

2 to 500ℓ/min
21,25,28,35MPa

Overview

Today's hydraulic systems demand high levels of automation, power efficiency, and energy efficiency, which is why the use of electro-hydraulic proportional valves is on the rise. Built-in

electronic components deliver outstanding response and fluid pressure that allows high output, as well as superior operation, and control. The NACHI Electrohydraulic Proportional

Valve Series includes the pressure control valves, flow control valves, and direction control valves that make it easy to meet these needs.

Features

① Pressure Control Valve Series

EPR Series – Small-volume direct driver type pilot relief valve

ER Series – Large-volume balanced piston type relief valve

EGB Series – Large-volume balanced piston type pressure reducing valve with relief function

The pressure control section uses a poppet structure, which is virtually impervious to the effects of dirt in the operating fluid for outstanding pressure stability.

② Flow Control Valve Series

ES Series – This 2-directional valve provides proportional flow control in accordance with input current.

ESR Series – With a built-in rod sensing function, this 3-way valve is for use in low-energy circuits.

A force feedback mechanism is used for main spool positioning, and amplification is performed by the pilot spool. The result is superior response with small hysteresis and outstanding flow rate reproduction.

③ Direction Flow Control Valve Series

ESD Series – This electro-hydraulic proportional valve provides both direction control and flow control functions. Mounting methods are the same as those for standard directional valves, which allows simple structuring and maintenance.

④ Modular Type Control Valve Series

EOG-G01 – This reduction valve with relief function can be used in ganged configurations.

EOF-G01 – This flow control valve combines a restrictor valve with a pressure compensation valve.

This dual configuration provides easy installation along with dramatically reduced space requirements.

⑤ Power Amplifiers

EMA Series – Amplifier type

EMC Series – Controller type

A current-feedback amplifier system is used to virtually eliminate output current fluctuation. The same power supply specifications apply to all types.

⑥ Compact Power Amplifiers

EBA Series – Amplifier type

The highly efficient PWM control system of this new series ensures high reliability in a compact configuration.

⑦ Compact, Multi-function Power Amplifiers

EDA Series – Amplifier type

This compact amplifier can drive two solenoids with a single DC input.

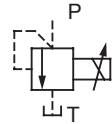
EDC Series – Amplifier controller type
A choice of inputs: 6-contact or DC 2 input/4- contact.

Series List

Name	Maximum Working Pressure MPa (kgf/cm ²)	Rated Flow Rate ℓ/min									
		1	2	10	50	100	200	300	400	500	
Electro-hydraulic Proportional Pilot Relief Valve (EPR)	35 {357}	01 – Size									
Electro-hydraulic Proportional Relief Valve (ER)	35 {357}			03		06					
Electro-hydraulic Proportional Relief and Reducing Valve (EGB)	25 {255}	03		06							
Electro-hydraulic Proportional Flow Control Valve (ES)	21 {214}	02		03		06		10			
Load Sensitive Electro-hydraulic Proportional Relief and Flow Control Valve (ESR)	25 {255}	03		06		10					
Electro-hydraulic Proportional Flow Control Valve (ESD)	25 {255}	01		03		04		06			
Modular Type Electro-hydraulic Proportional Reducing Valve (EOG)	25 {255}	01									
Modular Type Electro-hydraulic Flow Control Valve (EOF)	21 {214}	01									
Power Amplifier (EMA) (EMC)										—	
Compact Power Amplifier (EBA)										—	
Compact, Multi-function Power Amplifier (EDA) (EDC)										—	

Electro-hydraulic Proportional Pilot Relief Valve

1.2ℓ/min
0.3 to 35MPa



Features

This DC solenoid relief valve matches the suction force of a DC solenoid with fluid pressure. When connected to a small-volume hydraulic system or the

poppet of a balanced piston type pressure control valve, this valve provides continual pressure control in proportion to input current.

Specifications

Item	Model No.	EPR-G01-*-*-*-12
Rated Current ℓ/min		1.2
Pressure Control Range MPa{kgf/cm ² }		B:0.3 to 2.5 { 3.1 to 25.5 } 1:0.7 to 7 { 7.1 to 71 } 2:1.0 to 14 { 10 to 143 } 3:1.5 to 21 { 15.3 to 214 } 4:1.5 to 28 { 15.3 to 286 } 5:2.0 to 35 { 20 to 357 }
Rated Current mA		800
Coil Resistance Ω		20 (20°C)
Hysteresis %		3 max. (Note)
Weight kg		1.6

Note) Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Explanation of model No.

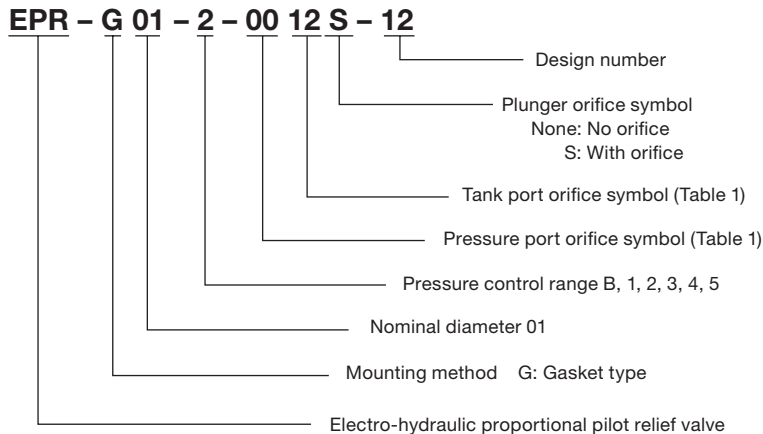


Table 1 Pressure Port and Tank Port Orifice Symbols

Orifice Symbol	00	08	09	10	11	12	13
Orifice Diameter	None	φ 0.8	φ 0.9	φ 1.0	φ 1.1	φ 1.2	φ 1.3

Note) The following are the standards for the orifice auxiliary symbols.

Pressure Control Range	Orifice Auxiliary Symbol
Type B, Type 1	0013S
Type 2, Type 3	0012S
Type 4	1212S
Type 5	1111S

● Handling

1 Air Bleeding

To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid. The position of the air vent can change by loosening the M4 screw and rotating the cover.

2 Mounting Method

Mounting on a vertical surface causes minimum pressure to increase by 0.2MPa {2kgf/cm²}.

3 Manual Pressure Adjusting Screw

For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise) and secured with the lock nut.

4 Minimum Relief Flow Rate

A small flow rate can cause setting pressure to become unstable. Use a flow rate of at least 0.3ℓ/min.

5 Load Capacity

When using this valve to control direct circuit pressure, make sure the load volume (valve P port side volume) is at least 40cm³.

6 Bundled Accessories (Valve Mounting Bolts)

M5 x 45ℓ(four) Tightening torque: 5 to 7N·m {51 to 71kgf·cm}

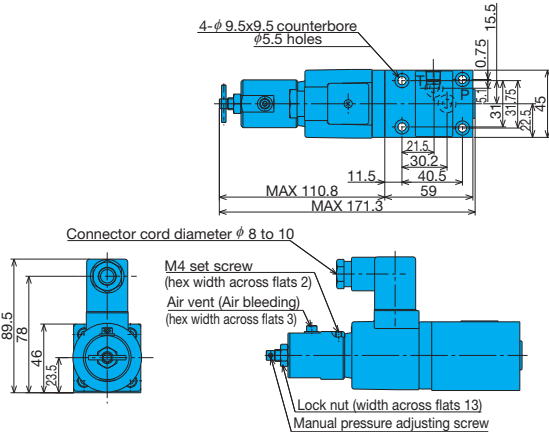
7 Sub Plate

When a sub plate is required, order using the following model number. MSA-01Y-10 (See the next page for dimensions.)

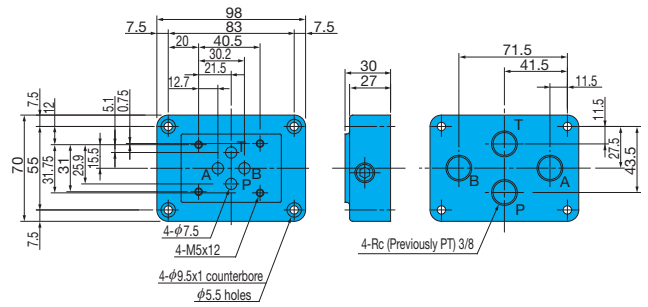
8 Use an operating fluid that conforms to the both of the following. Oil Temperature: -20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Installation Dimension Drawings

EPR-G01



Sub Plate
MSA-01Y-10

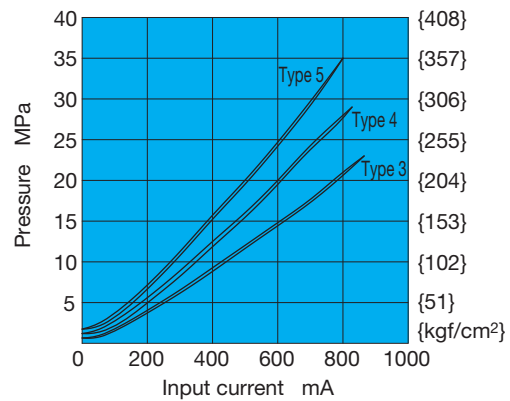
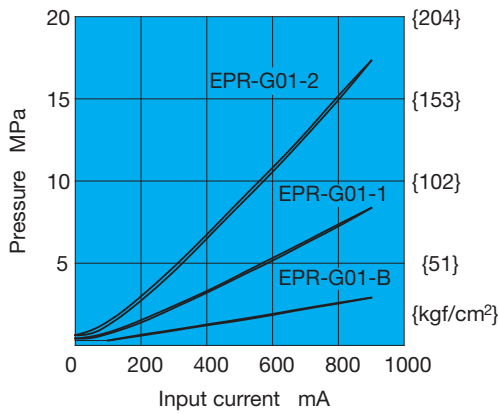


Note) Install the sub plate so the valve's P port is aligned with the sub plate's B port.
The gasket surface dimensions comply with the ISO standard shown below.
ISO 4401-03-02-0-05

Performance Curves

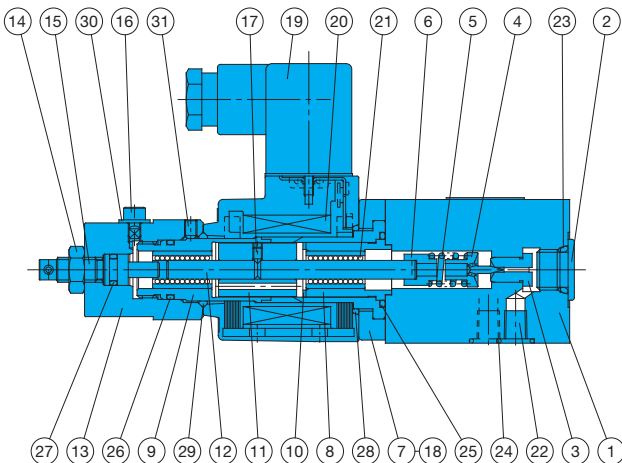
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Pressure Characteristics



Cross-sectional Drawing

EPR-G01-*-*-*-12



Part No.	Part Name
1	Body
2	Plug
3	Seat
4	Poppet
5	Spring
6	Retainer
7	Cover
8	Stopper
9	Guide
10	Shim
11	Plunger
12	Rod
13	Cover
14	Nut
15	Screw
16	Screw
17	Screw
18	Screw
19	Connector
20	Coil
21	Ball bush
22	Choke
23	O-ring
24	O-ring
25	O-ring
26	O-ring
27	O-ring
28	O-ring
29	O-ring
30	Seal
31	Screw

Seal Part List (Kit Model Number JPS-G01-1A)

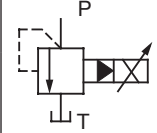
Part No.	Part Name	Part Number	Q'ty
23	O-ring	NBR-90 P11	1
24	O-ring	NBR-90 P9	2
25	O-ring	NBR-90 P22	1
26	O-ring	AS 568-016 (NBR-90)	1
27	O-ring	NBR-90 P7	1
28	O-ring	S-25 (NBR-70-1)	1
29	O-ring	NBR-70-1 P20	1
30	Seal	WF-4-7.4-1.0	1

Note) Coil model number JD64-D2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Electro-hydraulic Proportional Relief Valve

150 to 320ℓ/min
0.3 to 35MPa



Features

This valve combines a compact, high-performance electro-hydraulic proportional pilot relief valve and balanced piston type relief valve to provide pressure control in proportion to input current.

Throughput volume and oil temperature fluctuation has little effect on control pressure, so this valve provides open loop control of even complex pressures (forces).

● Handling

1 Air Bleeding

To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid.

2 Manual Pressure Adjusting Screw

For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise) and secured with the lock nut.

3 Tank Port Back Pressure

Make sure that tank port back pressure is as small as possible; no greater than 0.2MPa {2kgf/cm²}.

4 Safety Valve Setting Pressure

The safety valve is set to maximum adjustment pressure plus 1.5 to 2.0MPa {15.3 to 20.4kgf/cm²}. When actually using the valve, adjust in accordance with actual pressure.

5 Bundled Accessories (Valve Mounting Bolts)

Specifications

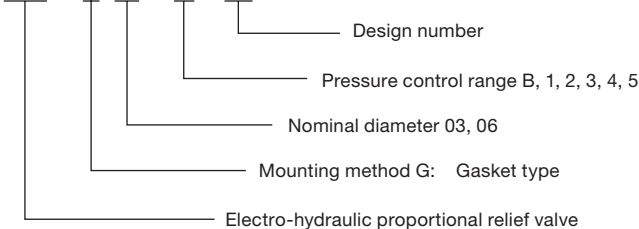
Item	Model No.	ER-G03-*21	ER-G06-*21
Maximum Flow Rate ℓ/min		150	320
Pressure Control Range MPa{kgf/cm ² }		B:0.3 to 2.5{ 3.1 to 25.5}(Note 1) 1:0.7 to 7 { 7.1 to 71 } 2:1.0 to 14 {10 to 143 } 3:1.5 to 21 {15.3 to 214 } 4:1.5 to 28 {15.3 to 286 } 5:2.0 to 35 {20 to 357 }	
Rated Current mA		800	
Coil Resistance Ω		20 (20°C)	
Hysteresis %		3 max. (Note 2)	
Minimum Relief Flow Rate ℓ/min		5	8
Weight kg		6.0	7.1

Note) 1. G03 type only Flow rate: 40ℓ/min

2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Explanation of model No.

ER - G 03 - 3 - 21

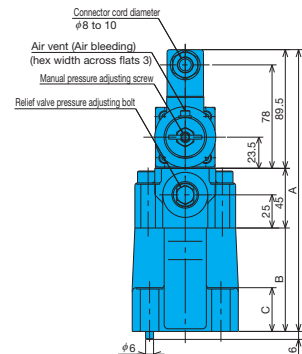
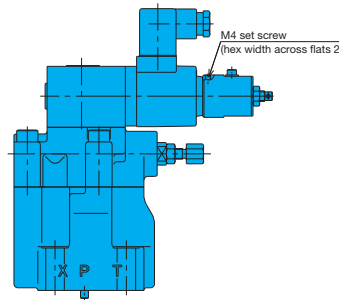
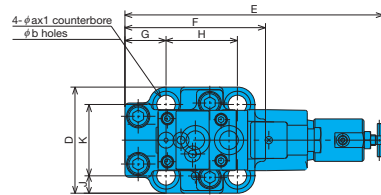


Model No.	Bolt Size	Q'ty	Tightening Torque N-m{kgf-cm}
ER-G03	M12×50ℓ	4	75 to 95{ 765 to 970}
ER-G06	M16×60ℓ	4	190 to 235{1940 to 2400}

6 Use an operating fluid that conforms to the both of the following. Oil Temperature: -20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Installation Dimension Drawings

ER-G**-*21

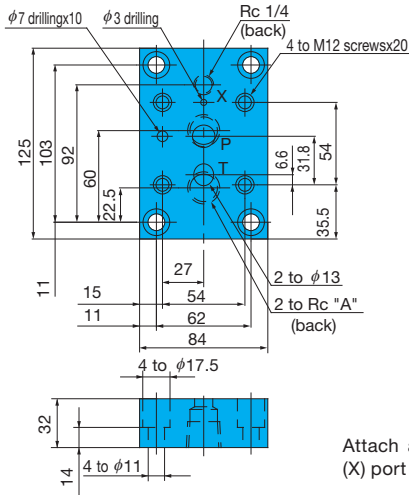


The gasket surface dimensions comply with the ISO standard shown below.

G03...ISO 6264-06-09-0-97
G06...ISO 6264-08-13-0-97

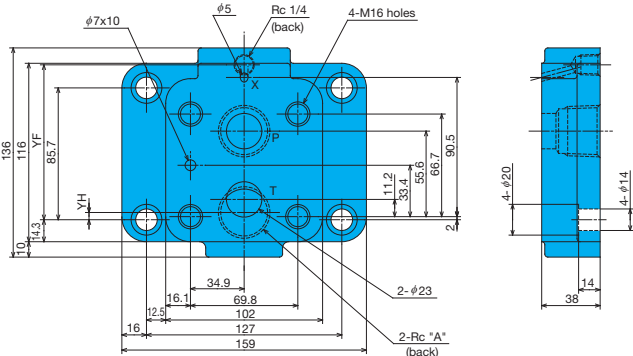
Model No.	A	B	C	D	E	F	G	H	J	K	a	b
ER-G03	212.5	78	33	80	194.8	106	31	53.8	13.1	53.8	20	14
ER-G06	217.5	83	37	100	203.8	119	37	66.7	15	70	26	17.5

Sub Plate (Maximum Operating Pressure: 25MPa)
MRI-03*-10



Attach a plug when the vent (X) port is not used.

MRI-06*-10

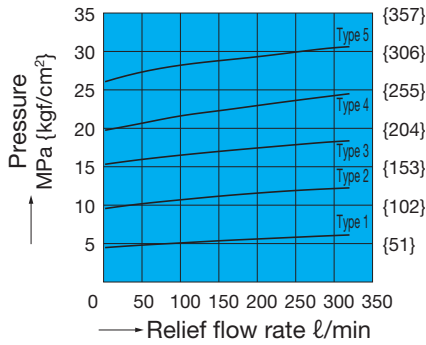


Model No.	A
MRI-03-10	3/8
MRI-03X-10	1/2
MRI-06-10	3/4
MRI-06X-10	1

Model No.	YF	YH
MRI-06-10	92.5	13.2
MRI-06X-10	100.7	4.7

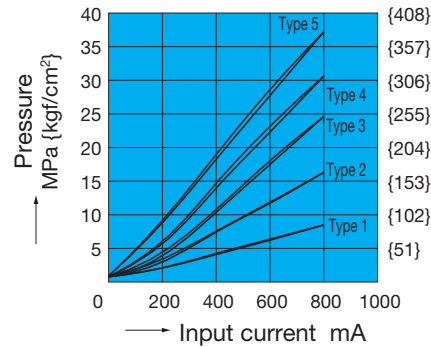
Performance Curves

Flow Rate – Pressure Characteristics
ER-G06*-21



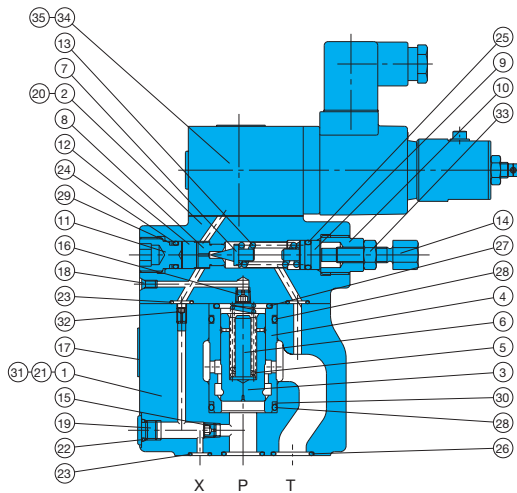
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Pressure Characteristics
ER-G06*-21



Cross-sectional Drawing

ER-G**-*-21



ER Valve Built-in Pilot Relief Valve List

Model No.	Built-in Pilot Relief Valve
ER-G03-B-21	EPR-G01-B-0011S-12
1	1-0011S-12
2	2-1313S-12
3	3-1212S-12
4	4-1111S-12
5	5-1010S-12
ER-G06-1-21	EPR-G01-1-0011S-12
2	2-1313S-12
3	3-1212S-12
4	4-1111S-12
5	5-1010S-12

Seal Part List (Kit Model Number REBS-**)

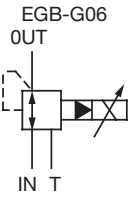
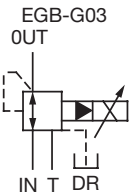
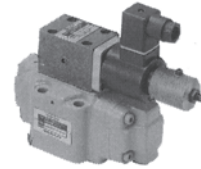
Part No.	Part Name	Nominal Diameter/Part Number		Q'ty
		G03	G06	
22	O-ring	NBR-90 P8	NBR-90 P8	1
23	O-ring	NBR-90 P9	NBR-90 P9	3
24	O-ring	NBR-90 P10A	NBR-90 P10A	1
25	O-ring	NBR-70-1 P11	NBR-70-1 P11	1
26	O-ring	NBR-90 P18	NBR-90 P28	2
27	O-ring	NBR-90 G25	NBR-90 P28	1
28	O-ring	NBR-90 G30	NBR-90 P32	2
29	Backup ring	T2-P10A	T2-P10A	1
30	Backup ring	T2-G30	T2-P32	1

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
2. For the ** part of the kit number, specify the valve size (G03, G06).
3. EPR-G01 pilot valve seal is available separately. See page I-3 for more information.

Part No.	Part Name	Part No.	Part Name
1	Body	18	Plug
2	Cover	19	Plug
3	Poppet	20	Screw
4	Sleeve	21	Pin
5	Spring	22	O-ring
6	Spacer	23	O-ring
7	Poppet	24	O-ring
8	Seat	25	O-ring
9	Plunger	26	O-ring
10	Retainer	27	O-ring
11	Plug	28	O-ring
12	Collar	29	Backup ring
13	Spring	30	Backup ring
14	Handle	31	Screw
15	Orifice	32	Choke
16	Orifice	33	Nut
17	Plate	34	Pilot relief valve
		35	Screw

Electro-hydraulic Proportional Relief and Reducing Valve

50 to 100ℓ/min
0.3 to 25MPa



Features

This valve combines a compact, high-performance electro-hydraulic pilot relief valve, and a reducing and relief valve for low-pressure control of pressure within a hydraulic system in proportion to input current.

Since this valve includes a relief function, OUT side pressure can be maintained at a virtually fixed level, even when the valve's OUT side is used as reaction force. This valve also provides outstanding response as pressure drops.

Specifications

Item	Model No.	EGB-G03-*-11	EGB-G06-*-11
Maximum Operating Pressure MPa(kgf/cm ²)		25(255)	
Maximum Flow Rate ℓ/min		50	100
Pressure Control Range MPa(kgf/cm ²)		B:0.3 to 2.5(3.1 to 25.5)(Note 1) 1:0.7 to 7 {7.1 to 71 } 2:1.0 to 14 {10 to 143 } 3:1.5 to 21 {15.3 to 214 }	
Rated Current mA		800	
Coil Resistance Ω		20 (20°C)	
Hysteresis %		3 max. (Note 2)	
Weight kg		5.5	7.8

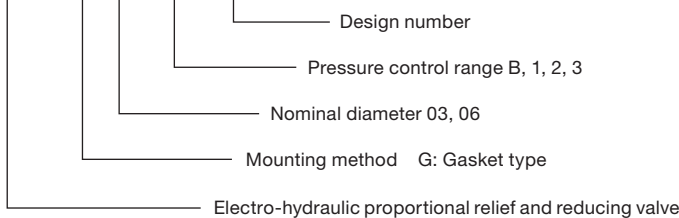
Note) 1. G03 type only Rated flow rate: 20ℓ/min
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

● Handling

- Air Bleeding**
To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid.
- DR Port Piping**
When configuring piping, ensure that the DR port (T port for the G06 size) is filled with operating fluid.
- Manual Pressure Adjusting Screw**
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise) and secured with the lock nut.
- Load Capacity**
The G03 load capacity (valve OUT side volume) is at least 2ℓ, while the G06 load capacity is at least 5ℓ.
- Bundled Accessories (Valve Mounting Bolts)**

Explanation of model No.

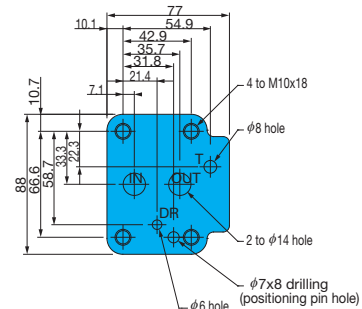
EGB - G 03 - 2 - 11



Model No.	Bolt Size	Q'ty	Tightening Torque N·m(kgf·cm)
EGB-G03	M10x75ℓ	4	45 to 55(460 to 560)
EGB-G06	M10x85ℓ	4	45 to 55(460 to 560)

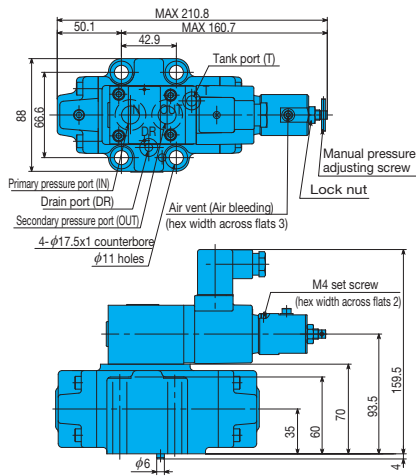
- Use an operating fluid that conforms to the both of the following. Oil temperature: -20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Mounding Gasket Dimensions EGB-G03-*-11

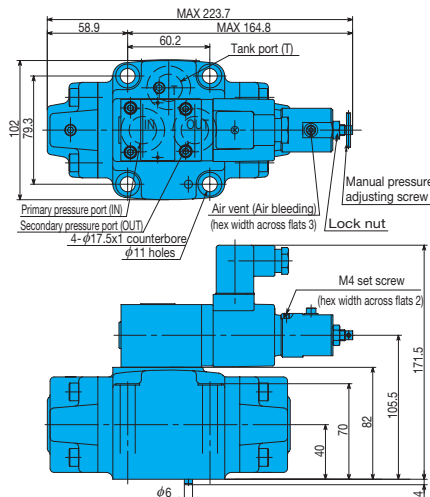


Installation Dimension Drawings

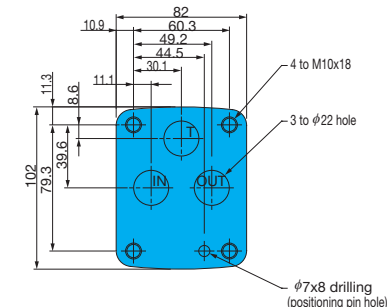
EGB-G03-*-11



EGB-G06-*-11



Mounding Gasket Dimensions EGB-G06-*-11

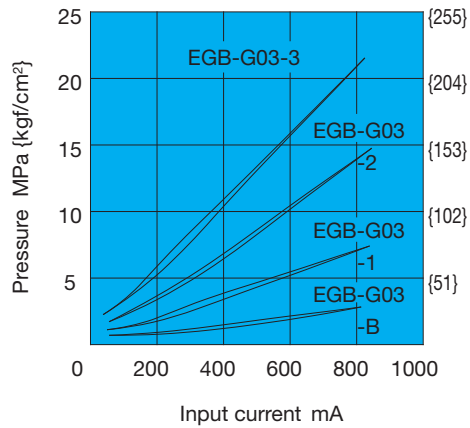


Performance Curves

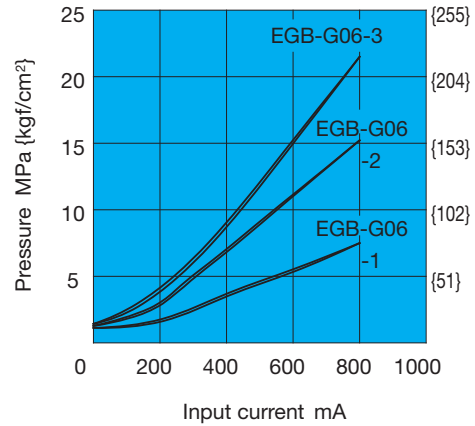
Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

Input Current – Pressure Characteristics

EGB-G03

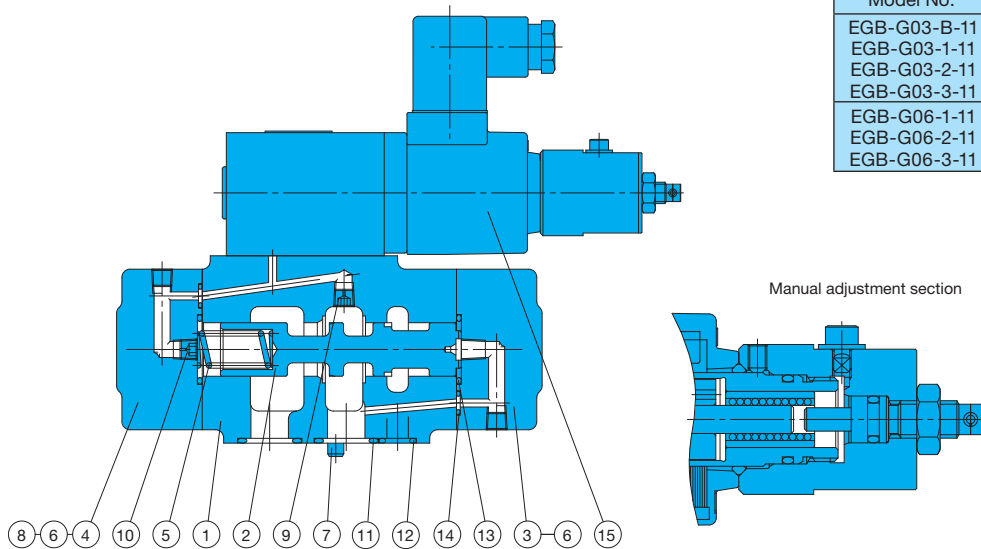


EGB-G06



Cross-sectional Drawing

EGB-G**-*-11



EGB Valve Built-in Pilot Relief Valve List

Model No.	Built-in Pilot Relief Valve
EGB-G03-B-11	EPR-GO1-B-0000-12
EGB-G03-1-11	1-0013-12
EGB-G03-2-11	2-0012-12
EGB-G03-3-11	3-0011-12
EGB-G06-1-11	EPR-G01-1-0013-12
EGB-G06-2-11	2-0012-12
EGB-G06-3-11	3-0012-12

Seal Part List (Kit Model Number JGS-**)

Part No.	Part Name	EGB-G03-*-11		EGB-G06-*-11	
		Part Number	Q'ty	Part Number	Q'ty
11	O-ring	NBR-90 P20	2	NBR-90 P26	3
12	O-ring	NBR-90 P10A	2	-	-
13	O-ring	NBR-90 P22	2	NBR-90 G30	2
14	O-ring	NBR-90 P6	2	NBR-90 P6	2

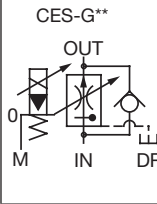
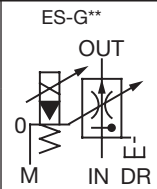
- Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.
 2. For the ** part of the kit number, specify the valve size (G03, G06).
 3. EPR-G01 pilot valve seal is available separately. See page I-3 for more information.

Part No.	Part Name
1	Body
2	Piston
3	Cover
4	Cover
5	Spring
6	Screw
7	Pin
8	Pin
9	Choke
10	Choke
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Pilot relief valve

Note) Coil model number JD64-D2

Electro-hydraulic Proportional Flow Control Valve

0.5 to 500ℓ/min
21MPa



Features

This valve controls actuator speed in response to the size of input current. Pressure and control oil temperature fluctuation has little effect on setting pressure, which enables high-precision

speed control. This valve is the perfect choice for actuator acceleration and deceleration control, and remote control.

● Handling

1 Air Bleeding

To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid. The position of the air vent can change by loosening the M4 screw and rotating the cover.

2 Manual Flow Rate Adjusting Screw

For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, the flow rate can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, this adjusting screw should be returned completely to its original position and secured with the lock nut.

3 Drain Port

Make sure that back pressure is no greater than 0.2MPa {2kgf/cm²}, and that this port is connected directly to the fluid tank at a point that is below the oil surface.

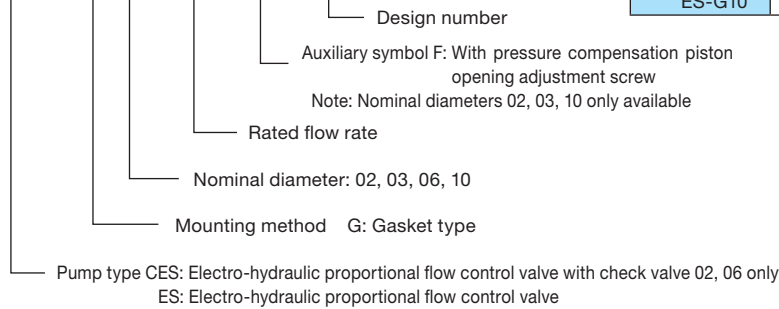
Specifications

Item	Model No.	(C)ES-G02-10 30(F)-12	ES-G03-60 125(F)-12	(C)ES-G06-250-11	ES-G10-500(F)-11
Maximum Operating Pressure MPa(kgf/cm ²)		21{214}	21{214}	21{214}	21{214}
Flow Rate Control Range ℓ/min		0.5 to 10/0.5 to 30	2 to 60/2 to 125	5 to 250	15 to 500
Minimum Allowable Valve Pressure Differential MPa(kgf/cm ²)		1.0{10}(Note1)	1.3{13.3}(Note1)	1.5{15.3}(Note1)	2{20.4}(Note1)
Reverse Flow Rate ℓ/min (With check valve only)		50	(125)(Note3)	200	-
Hysteresis %		3 max. (Note 2)	3 max. (Note 2)	3 max. (Note 2)	3 max. (Note 2)
Rated Current mA		800	800	800	800
Coil Resistance Ω		20 (20°C)	20 (20°C)	20 (20°C)	20 (20°C)
Weight kg		8.5	13	25	55

Note) 1. Control valve inlet and outlet pressure differential required to obtain favorable pressure compensation.
2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).
3. ES-G03 does not have a built-in check valve, but a sub plate with check valve (Model No. MCF-03-D-22) is available for it.

Explanation of model No.

(C)ES - G 02 - 30 - (F) - 12



Model No.	Bolt Size	Q'ty	Tightening Torque N·m(kgf·cm)
(C)ES-G02	M 8× 80ℓ	4	20 to 25{ 205 to 255}
ES-G03	M10× 75ℓ	4	45 to 55{ 460 to 560}
(C)ES-G06	M16×140ℓ	4	190 to 235{1940 to 2400}
ES-G10	M20×160ℓ	4	370 to 460{3770 to 4690}

4 Bundled Accessories (Valve Mounting Bolts)

5 The loss coefficient and control valve can cause resonance when there is a great distance between the flow control valve and actuator (when the pipe internal volume is large). Be sure to keep the distance between the flow control valve and actuator as small as possible, and to avoid the use of flexible hose as much as possible.

6 Sub Plate

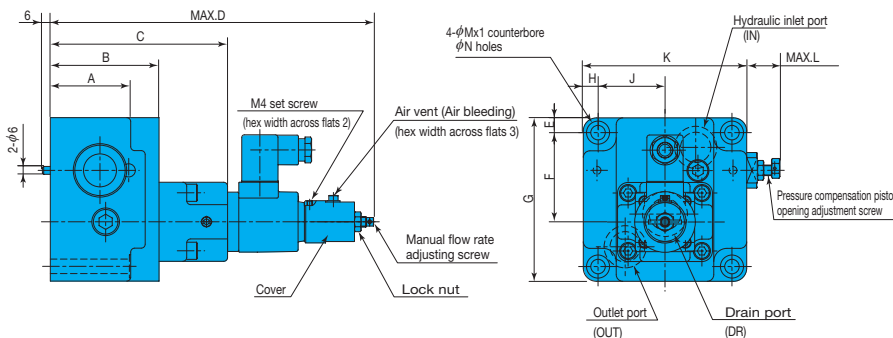
See the next page for more information about sub plates.

7 Use an operating fluid that conforms to the both of the following. Oil temperature: -20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

8 Since this valve has a built-in pressure compensation valve, changing of the inertial load (using a high inertial oil motor, etc.) can create the risk of hunching under certain conditions. Contact your sales agent before changing the inertial load.

Note) Use a hex wrench that has a width across flats of 8 to adjust the aperture adjustment screw of nominal diameter 10.

Installation Dimension Drawings

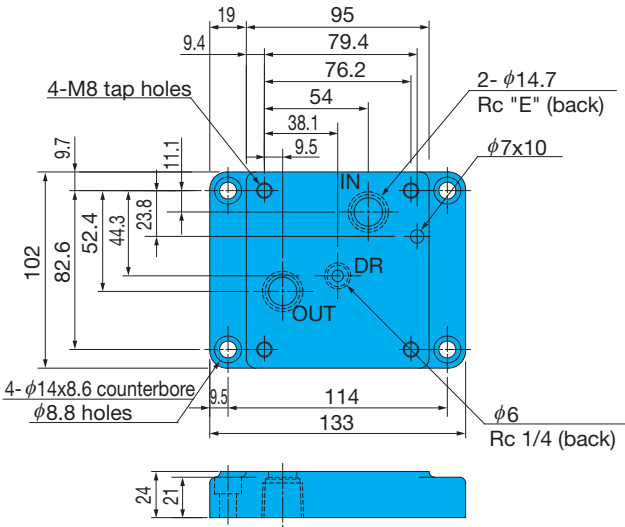


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N
(C)ES-G02	66	80	132	242.8	9.7	48	102	9.4	38.1	95	22.5	14	8.8
ES-G03	61	82.5	134.5	245.3	11.2	67.8	124	11.2	50.8	124	26	17.5	11
(C)ES-G06	115	130	182	292.8	16.8	104.8	167	17	73	180	-	26	18
ES-G10	137	160	215	326.3	25	148	228	23.5	98.5	244	18	32	22

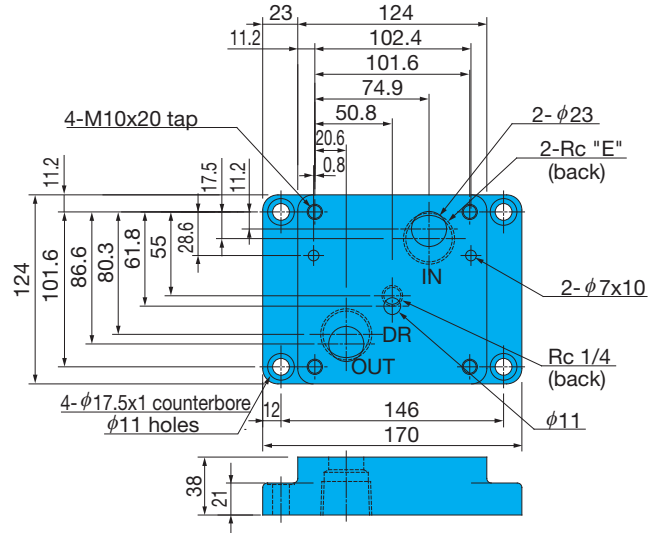
The gasket surface dimensions comply with the ISO standard shown below.

(C) ES-G02...ISO 6263-06-05-0-97
ES-G03...ISO 6263-07-09-0-97
(C) ES-G06...ISO 6263-08-13-0-97

Sub Plate
MES-02*-10



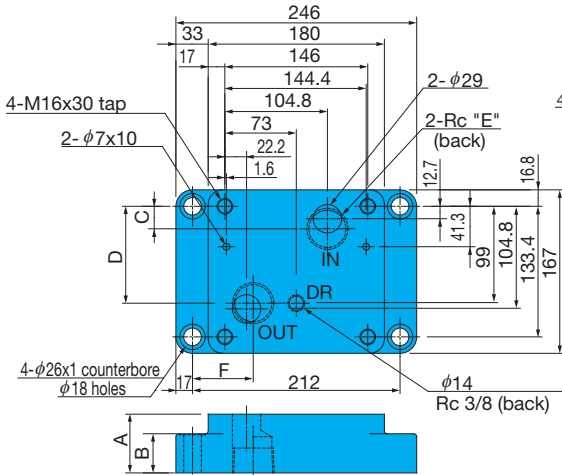
MES-03*-10



Model No.	E
MES-02X-10	3/8
MES-02Y-10	1/2

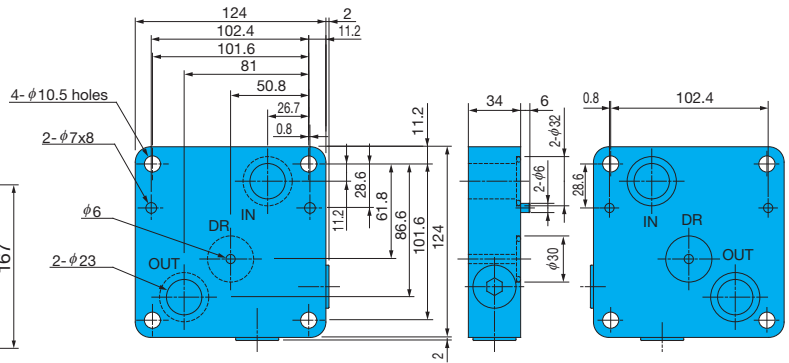
Model No.	E
MES-03Y-10	3/4
MES-03Z-10	1

MES-06*-10



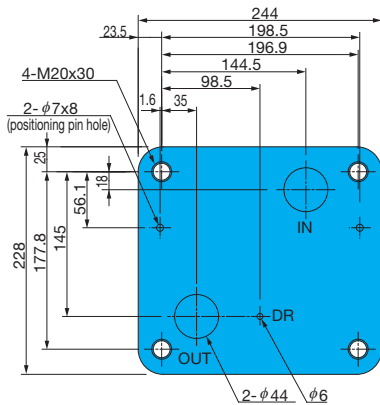
Model No.	A	B	C	D	E	F
MES-06X-10	45	25	16	104.8	1	55.2
MES-06Y-10	60	40	23	99	1 1/4	62

Auxiliary Plate with Check Valve
MCF-03-D-22



Bundled Items (Mounting Bolts) M10 x 110ℓ (Four)

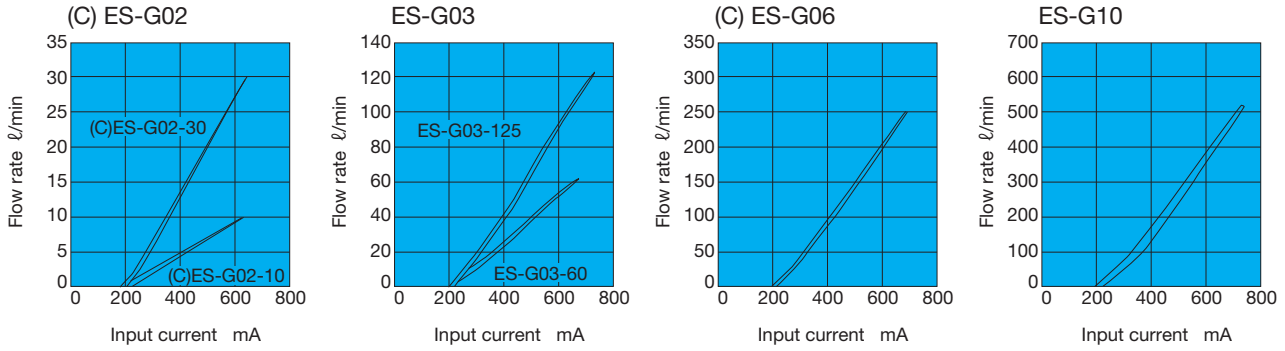
ES-G10 Mounting Gasket Surface Dimensions



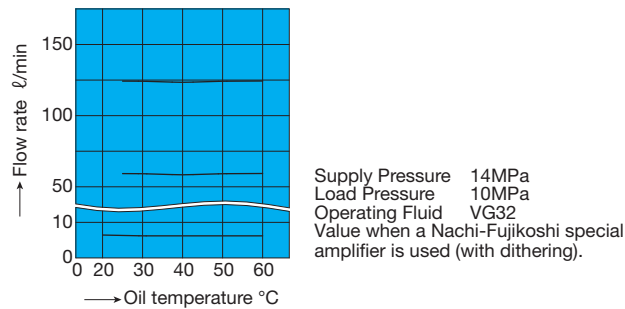
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

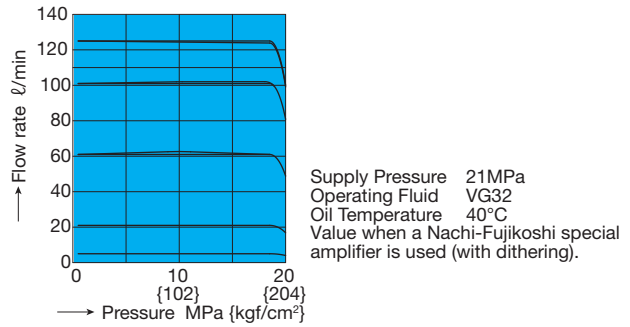
Input Current – Flow Rate Characteristics



Oil Temperature – Control Flow Rate Characteristics

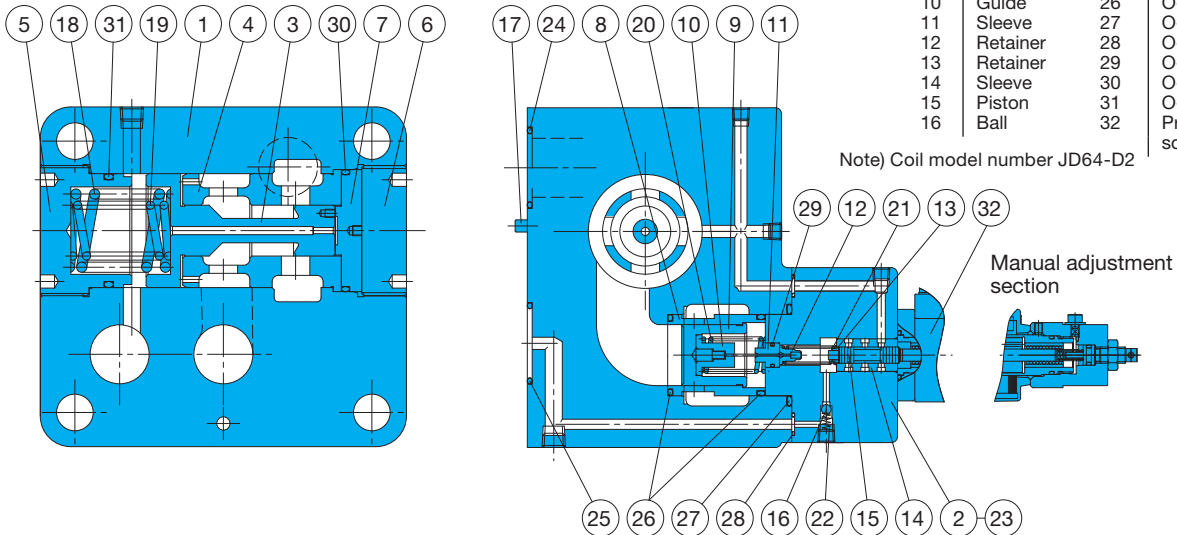


Pressure – Control Flow Rate Characteristics



Cross-sectional Drawing

ES-G**-*-11 (12)



Part No.	Part Name	Part No.	Part Name
1	Body	17	Pin
2	Cover	18	Spring
3	Piston	19	Spring
4	Sleeve	20	Spring
5	Plug	21	Spring
6	Plug	22	Spring
7	Retainer	23	Spring
8	Sleeve	24	O-ring
9	Spool	25	O-ring
10	Guide	26	O-ring
11	Sleeve	27	O-ring
12	Retainer	28	O-ring
13	Retainer	29	O-ring
14	Sleeve	30	O-ring
15	Piston	31	O-ring
16	Ball	32	Proportional solenoid

Note) Coil model number JD64-D2

Manual adjustment section

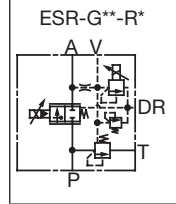
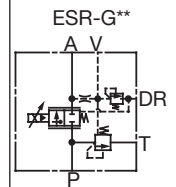
List of Sealing Parts

Part No.	Part Name	(C) ES-G02		ES-G03		(C) ES-G06		ES-G10	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
24	O-ring	NBR-90 P18	2	NBR-90 P26	2	NBR-90 G35	2	NBR-90 P48	2
25	O-ring	NBR-90 P24	1	NBR-90 P28	1	NBR-90 G35	1	NBR-90 P48	1
26	O-ring	-	-	-	-	NBR-90 G35	2	NBR-90 G50	2
27	O-ring	NBR-90 P29	1	NBR-90 P29	1	NBR-90 G45	1	NBR-90 G60	1
28	O-ring	NBR-90 P5	4	NBR-90 P5	4	NBR-90 P8	3	NBR-90 P9	3
29	O-ring	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1
30	O-ring	NBR-90 P18	1	NBR-90 P20	1	NBR-90 G55	1	NBR-90 G75	2
31	O-ring	NBR-90 P30	1	NBR-90 P38	1	NBR-90 P50	1	NBR-90 G75	1
Seal Kit Number		JFS-G02		JFS-G03		JFS-G06		JFS-G10	

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Load Response Electro-hydraulic Proportional Relief and Flow Control Valve

1 to 500ℓ/min
25MPa



Features

The load sensing function of this meter in flow control valve makes it possible to control pump discharge pressure automatically in accordance with the size of the load pressure.

Using this valve suppresses wasteful pump pressure rises and makes it possible to configure an energy-efficient circuit.

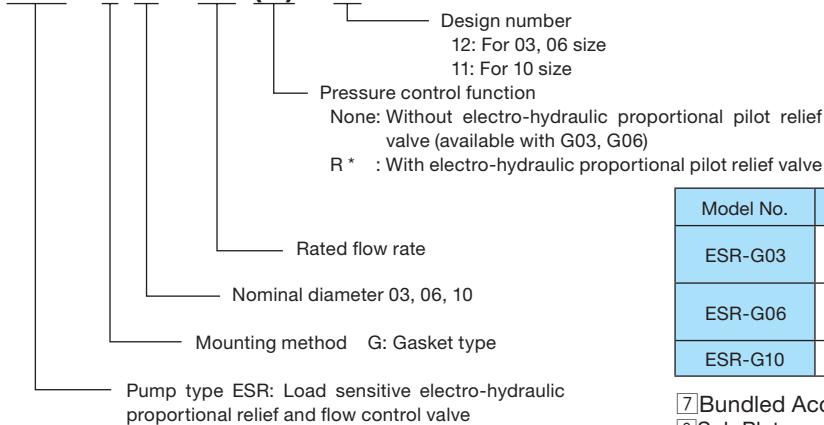
Specifications

Model No.		ESR-G03-125 (R*)-12	ESR-G06-250 (R*)-12	ESR-G10-500 R*-11	
Item					
Maximum Operating Pressure	MPa(kgf/cm ²)	25(255)	25(255)	25(255)	
Rated Flow Rate	ℓ/min	125	250	500	
Flow Rate Control System	Flow Rate Control Range	ℓ/min	2 to 125	5 to 250	15 to 500
	Valve Differential Pressure	MPa(kgf/cm ²)	0.5{5.1}(Note1)	0.7{7.1}(Note1)	0.9{9.2}(Note1)
	Hysteresis	%	3 max. (Note 2)	3 max. (Note 2)	3 max. (Note 2)
	Repeatability	%	1	1	1
	Rated Current	mA	800	800	800
	Coil Resistance	Ω	20(20°C)	20(20°C)	20(20°C)
Pressure Control System (Note 3)	Pressure Control Range	MPa(kgf/cm ²)	R1 : 1.2 to 7{12.2 to 71} R2 : 1.4 to 14{14.3 to 143} R3 : 1.6 to 21{16.3 to 214} R4 : 1.6 to 25{16.3 to 255}	R1 : 1.2 to 7{12.2 to 71} R2 : 1.4 to 14{14.3 to 143} R3 : 1.6 to 21{16.3 to 214} R4 : 1.6 to 25{16.3 to 255}	R1 : 1.2 to 7{12.2 to 71} R2 : 1.4 to 14{14.3 to 143} R3 : 1.6 to 21{16.3 to 214} R4 : 1.6 to 25{16.3 to 255}
	Hysteresis	%	3 max. (Note 2)	3 max. (Note 2)	3 max. (Note 2)
	Repeatability	%	1	1	1
	Rated Current	mA	800	800	800
	Coil Resistance	Ω	20 (20°C)	20 (20°C)	20 (20°C)
Weight	kg	14	28	60	

Note) 1. Indicates the pressure differential between the valve P port and A port.
 2. Value when a Nachi-Fujikoshi special amplifier is used (with dithering).
 3. These specifications apply to valves that include an electro-hydraulic proportional pilot relief valve (i.e. ESR-G06-250R2-11).
 4. The maximum adjustment pressure is 25MPa {255kgf/cm²} for a valve that does not include an electro-hydraulic proportional pilot relief valve. Factory default is minimum output (3.5MPa max.) Set this value in accordance with the pressure of the hydraulic circuit being used.

Explanation of model No.

ESR - G 06 - 250 () - 12**



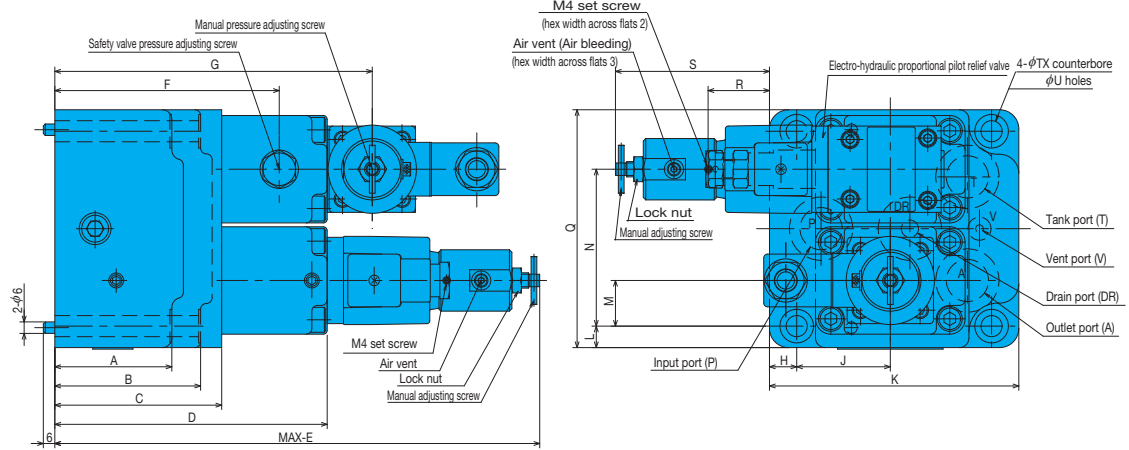
Model No.	Bolt Size	Q'ty	Tightening Torque N·m(kgf·cm)
ESR-G03	M10× 75ℓ	2	45 to 55{ 460 to 560}
	M10× 90ℓ	2	
ESR-G06	M16×100ℓ	2	190 to 235{1940 to 2400}
	M16×135ℓ	2	
ESR-G10	M20×130ℓ	6	370 to 460{3770 to 4690}

- 7 Bundled Accessories (Valve Mounting Bolts)
- 8 Sub Plate
See the next page for more information about sub plates.
- 9 Use an operating fluid that conforms to the both of the following. Oil temperature: - 20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.
- 10 Since this valve has a built-in pressure compensation valve, changing of the inertial load (using a high inertial oil motor, etc.) can create the risk of hunching under certain conditions. Contact your sales agent before changing the inertial load.

● Handling

- 1 Air Bleeding
In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation.
- 2 Manual Adjusting Screw
For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, pressure or flow rate can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, this adjusting screw should be returned completely to its original position and secured with the lock nut.
- 3 Drain Port
Minimum control pressure is increased by drain port back pressure, so be sure to connect the drain port directly to the fluid tank at a point that is below the oil surface.
- 4 Safety Valve Setting Pressure
For a safety valve without an electro-hydraulic proportional pilot relief valve, safety valve pressure is set to minimum pressure (3.5MPa max.) In the case of a safety valve with an electrohydraulic proportional pilot relief valve, the safety valve setting pressure is set to the minimum adjustment pressure plus 1.5MPa. When actually using the valve, adjust in accordance with hydraulic circuit pressure.
- 5 Minimum Relief Flow Rate During Pressure Control
Setting pressure can become unstable when the relief flow rate to the valve's T port is small. Because of this, use a relief flow rate of at least 10ℓ/min with a nominal diameter of 03 or 06, and a relief flow rate of at least 20ℓ/min with a nominal diameter of 10.
- 6 Valve Mounting Orientation
When an electro-hydraulic proportional pilot relief valve main valve is mounted on a vertical surface with the pilot relief valve part facing downwards make it difficult to bleed air from the pilot relief valve. Because of this, you should not use this type of mounting orientation.

Installation Dimension Drawings

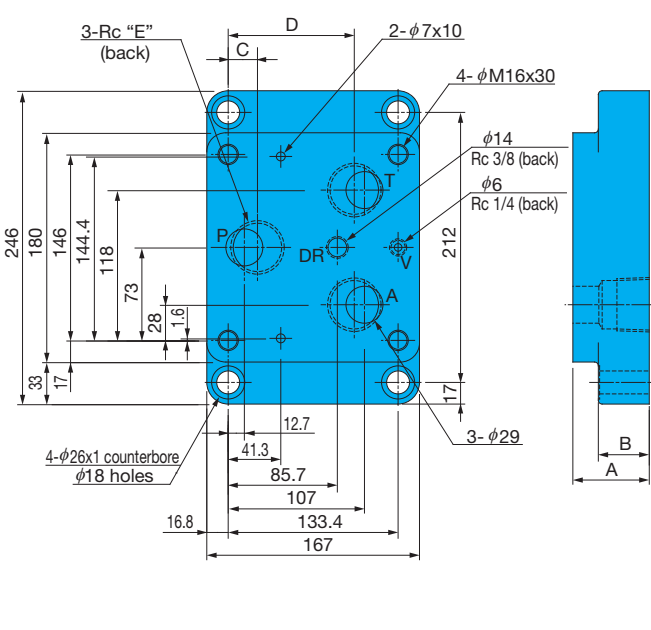
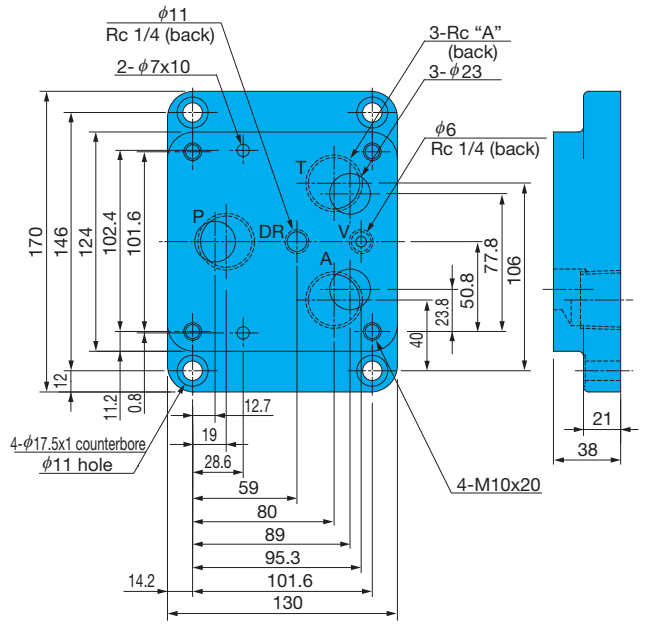


Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	Q	R	S	T	U
ESR-G03	61	76	87	142	252.8	117	165.5	14.2	48.8	130	11.2	23.8	81.8	124	32	80.3	17.5	11
ESR-G06	76	110	120	172	282.8	154	195.5	16.8	57.2	167	17	28	118	180	21	68.3	26	18
ESR-G10	107	107	150	205	317.3	183	228.5	25	76	228	23.5	35	162	244	-3	35.3	32	22

Sub Plate

MSR-03*-10

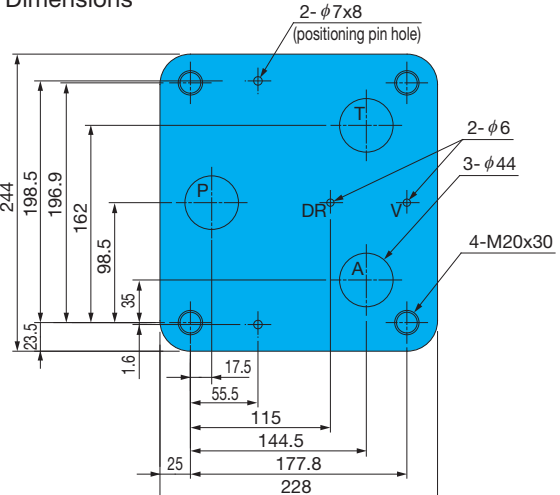
MSR-06*-10



Model No.	A
MSR-03Y-10	3/4
MSR-03Z-10	1

Model No.	A	B	C	D	E
MSR-06X-10	95	25	16	107	1
MSR-06Y-10	60	40	23	99	1 1/4

ESR-G10 Mounting Gasket Surface Dimensions

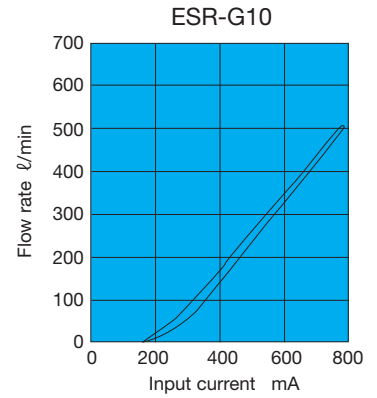
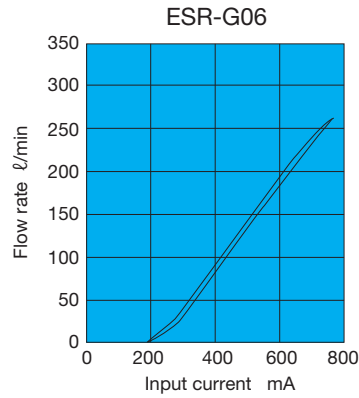
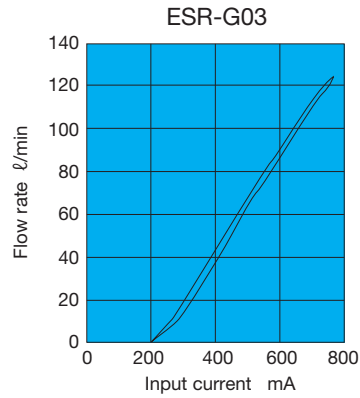


The gasket surface dimensions comply with the ISO standards shown below.
 ESR-G03...ISO 6263-07-11-1-97
 ESR-G06...ISO 6263-08-15-1-97

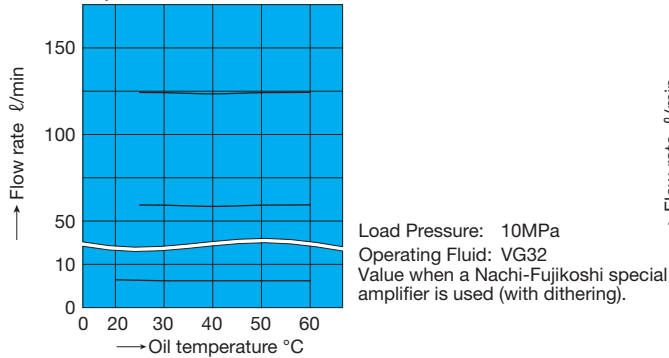
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

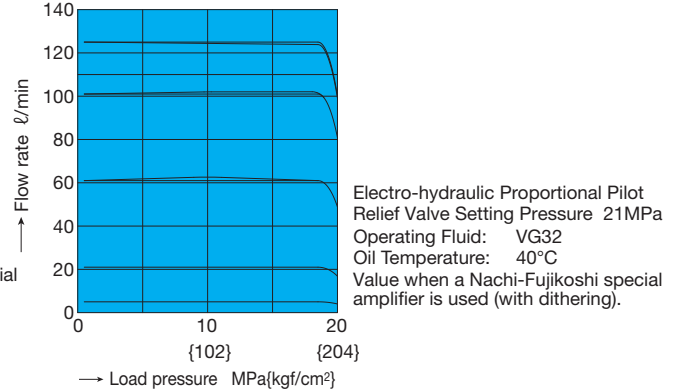
Input Current – Flow Rate Characteristics



Oil Temperature – Control Flow Rate Characteristics

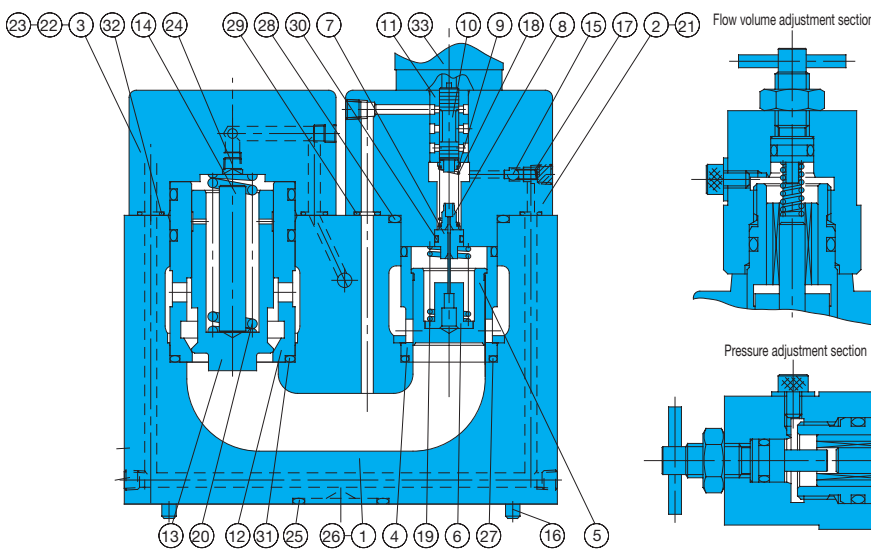


Pressure – Control Flow Rate Characteristics



Cross-sectional Drawing

ESR-G** -***-11,12



Part No.	Part Name	Part No.	Part Name
1	Body	18	Spring
2	Cover (A)	19	Spring
3	Cover (B)	20	Spring
4	Sleeve	21	Screw
5	Spool	22	Screw
6	Guide	23	Safety valve
7	Sleeve	24	Choke
8	Retainer	25	O-ring
9	Retainer	26	O-ring
10	Piston	27	O-ring
11	Sleeve	28	O-ring
12	Sleeve	29	O-ring
13	Poppet	30	O-ring
14	Guide	31	O-ring
15	Ball	32	O-ring
16	Pin	33	Proportional solenoid
17	Spring		

Note) Coil model number JD64-D2

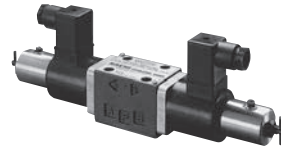
List of Sealing Parts

Part No.	Part Name	ESR-G03		ESR-G06		ESR-G10	
		Part Number	Q'ty	Part Number	Q'ty	Part Number	Q'ty
25	O-ring	NBR-90 P26	4	NBR-90 G35	4	NBR-90 P48	4
26	O-ring	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1
27	O-ring	NBR-90 G25	2	NBR-90 G35	2	NBR-90 G50	2
28	O-ring	NBR-90 G35	1	NBR-90 G45	1	NBR-90 G60	1
29	O-ring	NBR-90 P6	3	NBR-90 P8	3	NBR-90 P9	3
30	O-ring	NBR-90 P9	1	NBR-90 P9	1	NBR-90 P9	1
31	O-ring	NBR-90 G35	3	NBR-90 P46	3	NBR-90 G65	3
32	O-ring	NBR-90 P6	2	NBR-90 P8	2	NBR-90 P9	2
Seal Kit Number		JLS-G03R		JLS-G06R		JLS-G10R	

Note) 1. The materials and hardness of the O-ring conforms with JIS B2401.

2. EPR-G01 seal is available separately. See page I-3 for more information.

Electro-hydraulic Proportional Flow 10 to 250ℓ/min and Directional Control Valve 25MPa



Features

This valve uses a DC solenoid in a traditional 4- way solenoid valve to create a solenoid valve capable of both direction switching and highspeed control. The lineup consists of the direct system 01 size and the pilot system 03, 04, and 06 sizes. Direction control is performed by supplying input current to one of the two

proportional solenoid valves, and the size of the flow rate is controlled in accordance with the size of the input current. This type of valve can be used for remote control and shockless acceleration and deceleration control, and for simple configuration of hydraulic circuits.

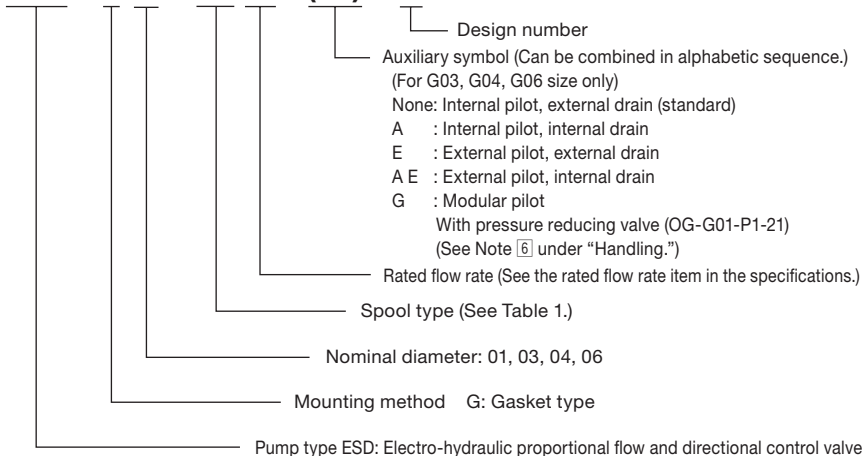
Specifications

Item	Model No.	ESD-G01-** 10 20 -12	ESD-G03-** 40- 80- (**)-12	ESD-G04- **140- (**)-12	ESD-G06- **250- (**)-13
Maximum Operating Pressure MPa(kgf/cm ²)		25{25.5}			
Rated Flow Rate ℓ/min		10/20(Note 1)	40/80(Note 1)	140(Note 1)	250(Note 1)
Maximum Flow Rate ℓ/min		25(Note 2)	100(Note 2)	140(Note 2)	250(Note 2)
Pilot Pressure MPa(kgf/cm ²)		At least 1.0{10}(Note 3)			
Pilot Flow Rate ℓ/min		-	At least 2(Note 4)	At least 3(Note 4)	At least 5(Note 4)
T Port Allowable Back Pressure MPa(kgf/cm ²)	2.5{25.5}	Internal Drain: 2.5 {25.5} External Drain: 21 {214}			
Rated Current mA		850			
Coil Resistance Ω		20(20°C)			
Hysteresis %		5 max.(Note 5)			
Response Time S		0.04(Note 6)	0.05(Note 6)	0.08(Note 6)	0.1(Note 6)
Weight kg		2.2	7	9.2	15

- Note) 1. Value when pressure drop volume to P→A and P→B is ΔP = 1.0MPa {10kgf/cm²}.
 2. Indicates maximum throughput volume value between each port.
 3. Indicates differential between the pilot port and tank port, or drain port.
 4. Value when 0.1 second is assumed for the response time from zero to the rated flow volume.
 5. Value when a Nachi-Fujikoshi special amplifier is used.
 6. Response time is typical value for a supply pressure of 14MPa {143kgf/cm²} and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

Explanation of model No.

ESD - G 03 - C5 80 - (*) - 12**



● Handling

1 Air Bleeding

In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation. For details, see the user's guide.

2 T Port Piping

When configuring piping, ensure that the T port (pilot valve T port for the G03, G04, and G06 sizes) is filled with operating fluid.

3 Manual Adjusting Screw

For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, the valve can be operated and valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise).

4 Valve Mounting Orientation

Install the valve so the spool axis line is horizontal.

5 Combining with a Pressure Compensation Valve

Use of the optional pressure compensation kit is recommended when higher precision flow rate control is required or in high-pressure applications. For details, see page I-20.

6 If pilot pressure (ESD-G03, G04, G06) exceeds 9MPa {92kgf/cm²} use a modular type P port reduction valve (OG-G01-P1-21) at a setting of 2MPa {20kgf/cm²}.

7 On a system that requires large brake pressure during deceleration or a system that uses a vertical cylinder, equip a counter balance valve. Use a single rod, if the rod exit is not slowed sufficiently, use a counter balance valve on the rod.

8 Maintain hydraulic operating fluid contamination so it is at least Class 9. Use of a G01 modular filter (Absolute: 8μm) is also helpful. (Example: Taisei Kogyo Co., Ltd. MVF-01-8C-1)

(Continued on next page)

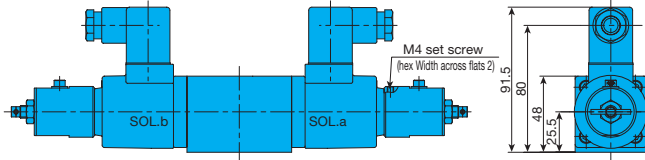
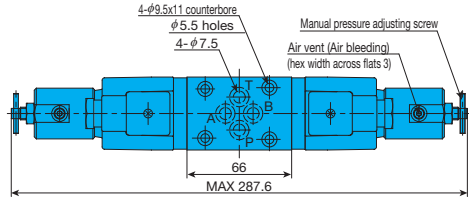
Table 1

Spool Type	Hydraulic Circuit		
	ESD-G01	ESD-G03,G04	ESD-G06
C5			
C6S			

Installation Dimension Drawings

9 Bundled Accessories (Valve Mounting Bolts)

ESD-G01



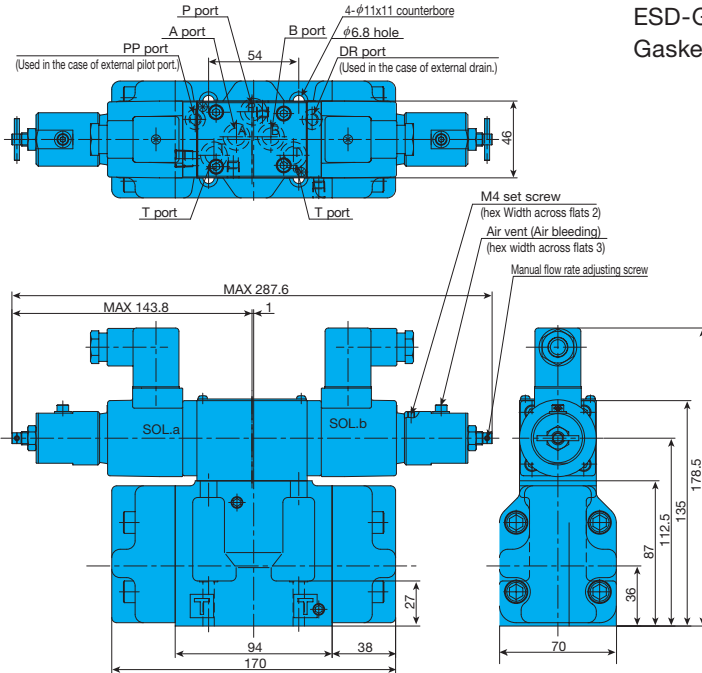
Model No.	Bolt Size	Q'ty	Tightening Torque N·m{kgf·cm}
ESD-G01	M 5×45ℓ	4	5 to 7{ 51 to 71}
ESD-G03	M 6×35ℓ	4	10 to 13{ 102 to 133}
ESD-G04	M 6×45ℓ	2	10 to 13{ 102 to 133}
	M10×50ℓ	4	45 to 55{ 460 to 560}
ESD-G06	M12×60ℓ	6	60 to 70{ 610 to 715}

For information about sub plates, see MSA-01Y-10 on page I-3.

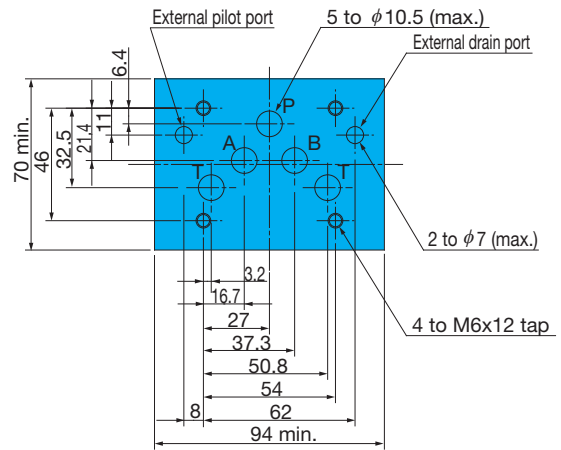
Gasket Surface Dimensions
(ISO 4401-03-02-0-94)

10 Use an operating fluid that conforms to the both of the following. Oil temperature: -20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

ESD-G03



ESD-G03 Mounting Gasket Surface Dimensions
Gasket Surface Mounting Dimensions (ISO4401-05-0-05)



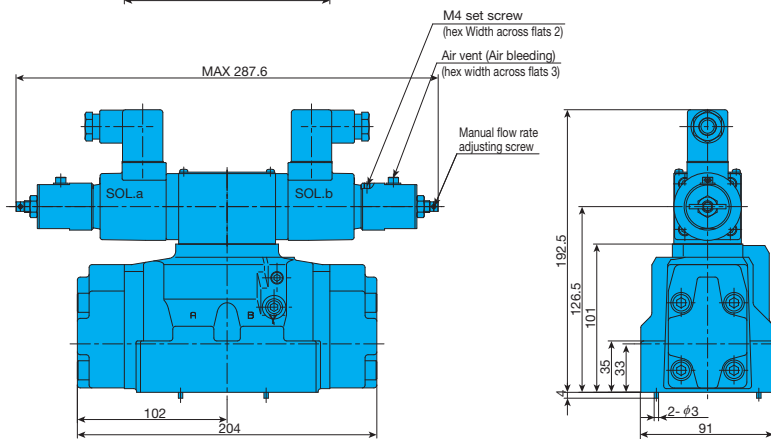
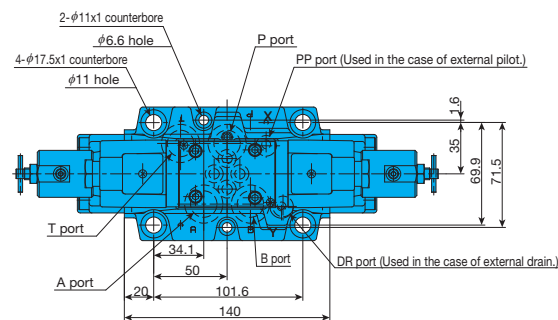
- Auxiliary symbol G: Equipping a modular type pilot reduction valve increases the height by 40mm.
- The gasket surface dimensions comply with the ISO standards shown below.

ESD-G04...ISO 4401-07-06-0-05

ESD-G06...ISO 4401-08-07-0-05

ESD-G10...ISO 4401-10-08-0-05

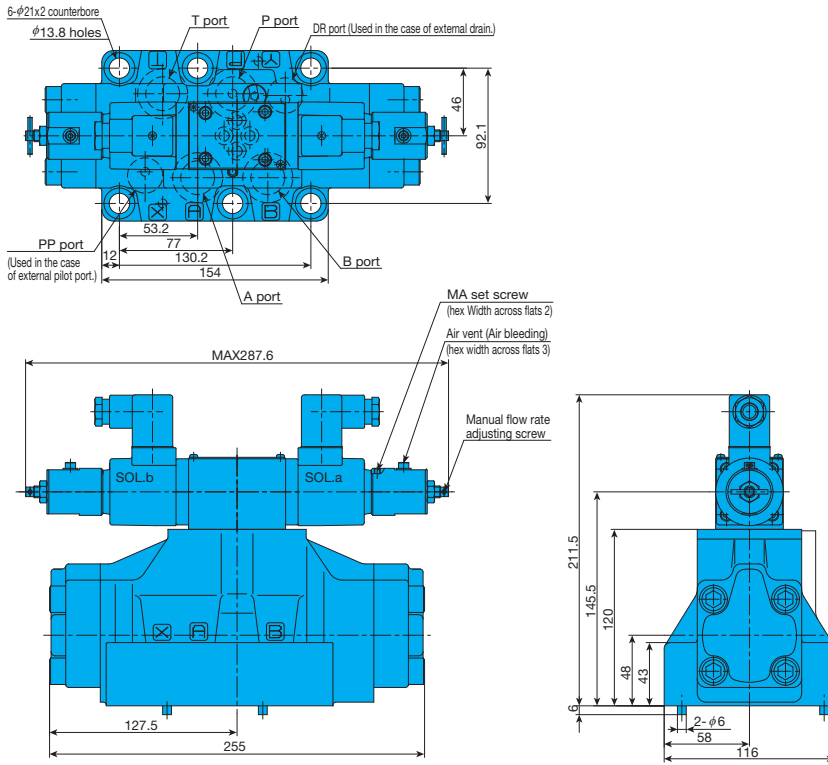
ESD-G04



Note) The coil cover has an M4 set screw.

To change the air vent orientation, loosen the M4 screw and then rotate the cover. After bleeding air, tighten the cover and then secure it with the M4 screw.

ESD-G06



Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

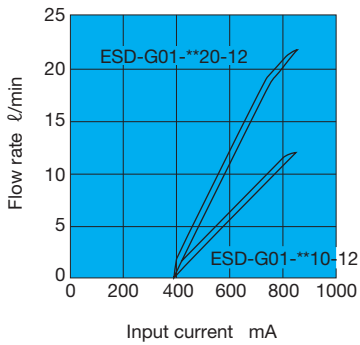
Input Current – Flow Rate Characteristics are characteristic when the P→A or P→B pressure drop is ΔP = 1.0MPa {10kgf/cm²}.

For Pressure – Flow Rate Characteristics, the horizontal shaft valve differential pressure indicates the pressure drop volume of the entire control valve

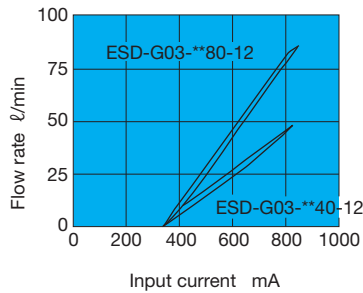
(between P, A, B, T), and flow rate is measured at the oil motor.

Input Current – Flow Rate Characteristics

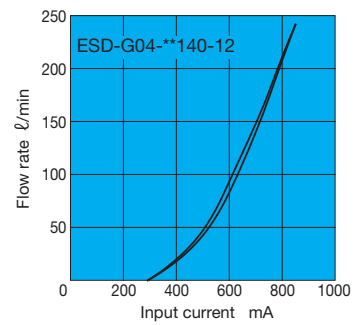
ESD-G01



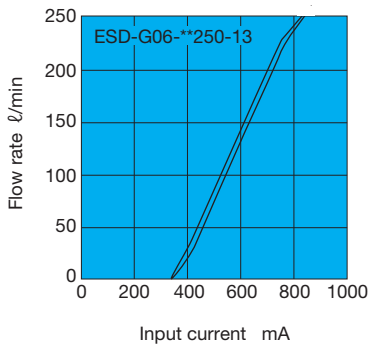
ESD-G03



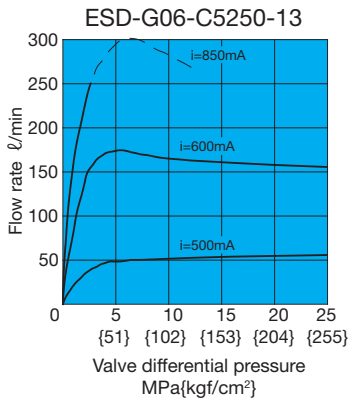
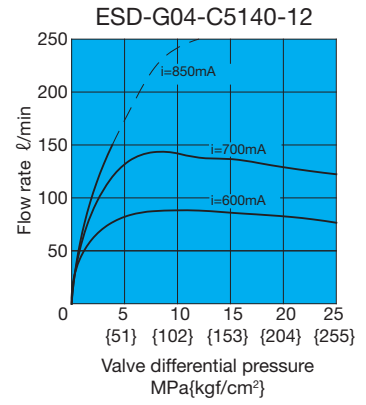
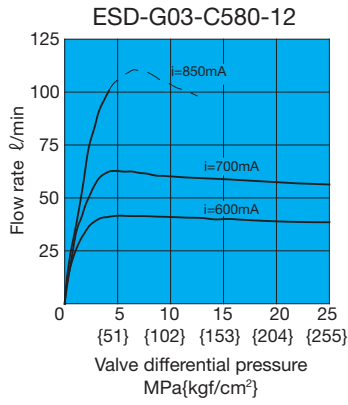
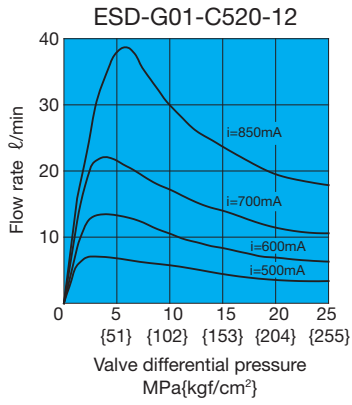
ESD-G04



ESD-G06

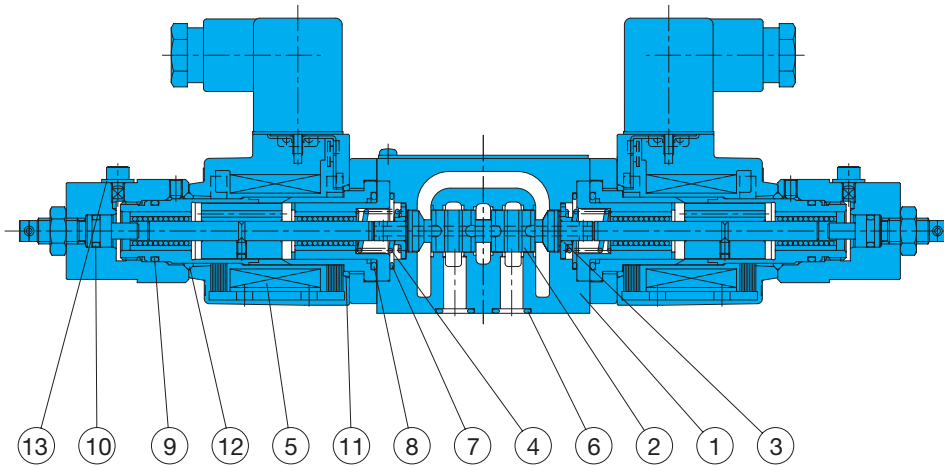


Pressure – Flow Rate Characteristics



Cross-sectional Drawings

ESD-G01-****-12



Part No.	Part Name
1	Body
2	Spool
3	Retainer
4	Spring
5	Coil
6	O-ring
7	O-ring
8	O-ring
9	O-ring
10	O-ring
11	O-ring
12	O-ring
13	Seal

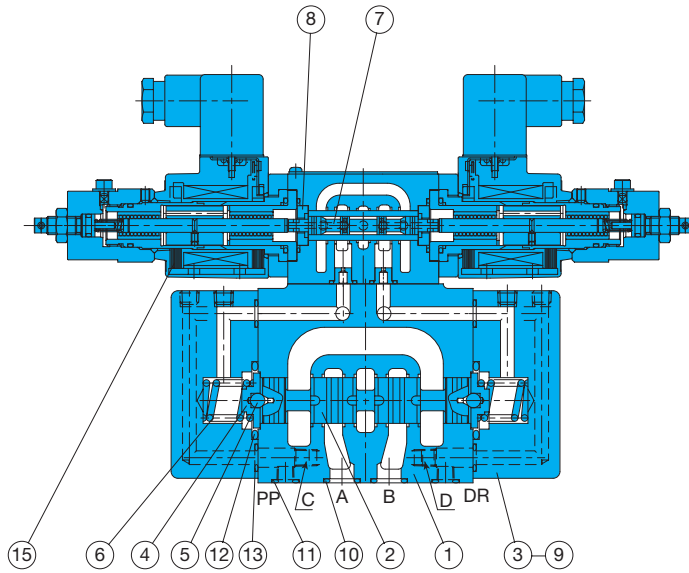
Note) Coil model number JD64-D2

Seal Part List (Kit Model Number JDS-G01-1A)

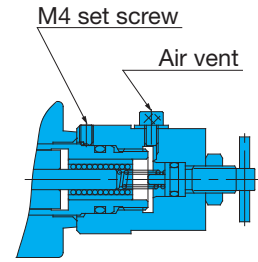
Part No.	Part Name	Part Number	Q'ty
6	O-ring	AS 568-012(NBR-90)	4
7	O-ring	AS 568-019(NBR-90)	2
8	O-ring	NBR-90 P22	2
9	O-ring	AS 568-016(NBR-90)	2
10	O-ring	NBR-90 P7	2
11	O-ring	S-25(NBR-70-1)	2
12	O-ring	NBR-70-1 P20	2
13	Seal	CW1000F0	2

Note) The materials and hardness of the O-ring conforms with JIS B2401.

ESD-G03-****-(**)-12



Manual adjustment section
(ESD-G03, G04, G06, G10)

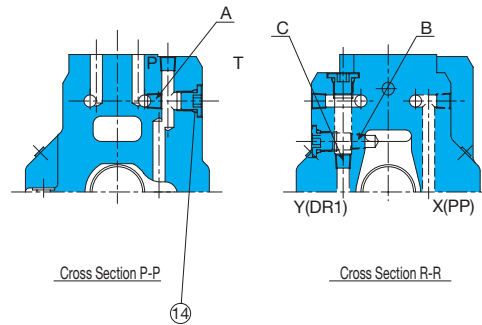
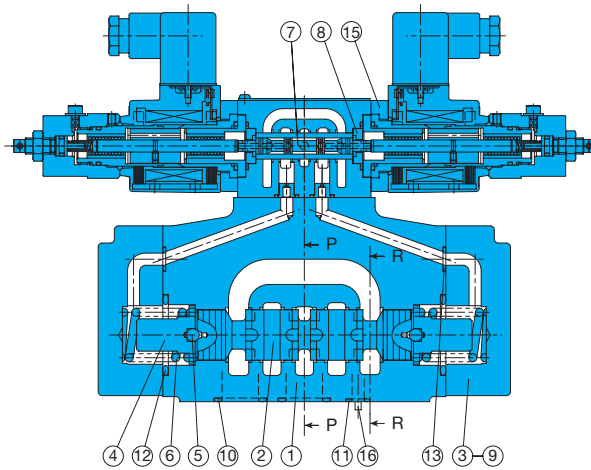


Note) The coil cover has an M4 set screw. When changing the orientation of the air vent, loosen the M4 screw and rotate the cover. Retighten after bleeding the air.

Methods for Changing the Pilot/Drain System

After Change		Hexagon Socket Head Plug
Pilot	Internal	Change to PP port from C.
	External	Change from PP port to C.
Drain	Internal	Change from D to DR port.
	External	Change from DR port to D.

ESD-G04-****-(**)-12



Part No.	Part Name
1	Body
2	Spool
3	Cover
4	Retainer
5	Ball
6	Spring
7	Pilot spool
8	Stopper
9	Screw
10	O-ring
11	O-ring
12	O-ring
13	O-ring
14	O-ring
15	Proportional solenoid

Note) Coil model number JD64-D2

Methods for Changing the Pilot/Drain System

After Change		Hexagon Socket Head Plug
Pilot	Internal	Remove from (A)
	External	Insert from (A)
Drain	Internal	Change from (B) to (C)
	External	Change from (C) to (B)

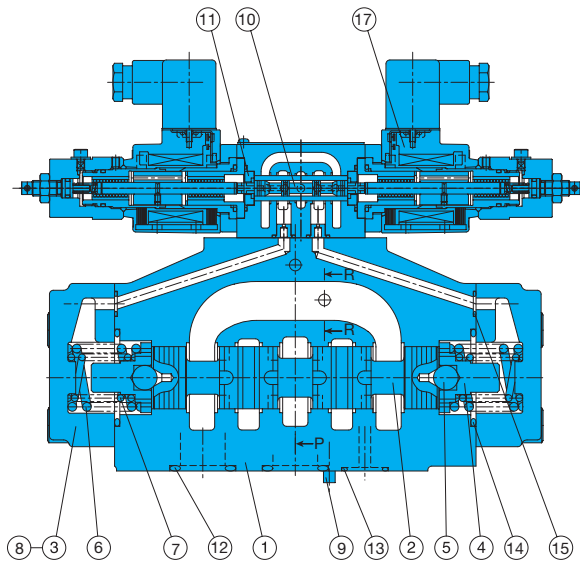
Note) A single hex head plug (NPTF 1/16) is required when changing to external pilot.
Hex Head Plug: TPUA-1/16

Seal Part List (Kit Model Number JHS-**)

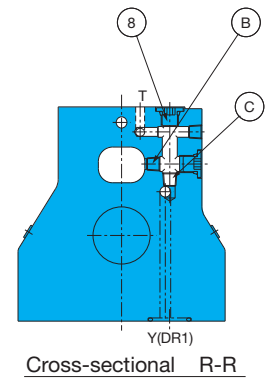
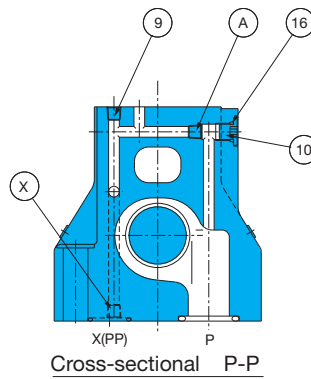
Part No.	Part Name	ESD-G03		ESD-G04	
		Part Number	Q'ty	Part Number	Q'ty
10	O-ring	NBR-90 P12	5	NBR-90 P22	4
11	O-ring	NBR-90 P9	2	NBR-90 P10A	2
12	O-ring	NBR-90 P28	2	NBR-90 P34	2
13	O-ring	NBR-90 P9	6	NBR-90 P9	2
14	O-ring	—	—	NBR-90 P8	3
Kit Model No.		JHS-G03		JHS-G04	

Note) The materials and hardness of the O-ring conforms with JIS B2401.

ESD-G06-****-(***)-13



Pilot, Drain System Change



Seal Part List (Kit Model Number JHS-G06)

Part No.	Part Name	Part Number	Q'ty
12	O-ring	NBR-90 P28	4
13	O-ring	NBR-90 P20	2
14	O-ring	NBR-90 G45	2
15	O-ring	NBR-90 P10	2
16	O-ring	NBR-90 P8	3

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Changing the Pilot and Drain Connections

After Change		Hexagon Socket Head Plug
Pilot	Internal	Switch from (A) to (X).
	External	Switch from (X) to (A).
Drain	Internal	Switch from (B) to (C).
	External	Switch from (C) to (B).

Part No.	Part Name
1	Body
2	Spool
3	Cover
4	Retainer
5	Ball
6	Spring
7	Spring
8	Screw
9	Pin
10	Pilot spool
11	Stopper
12	O-ring
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Proportional solenoid

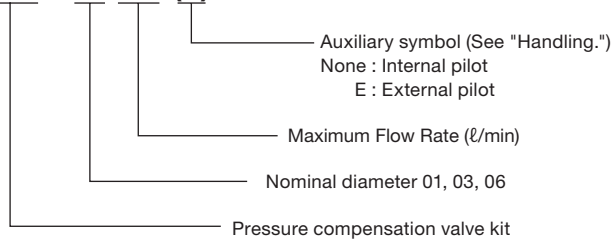
Pressure compensation valve kit

Specifications

Item	Model No.	JHF-01027	JHF-03040(E)	JHF-03080(E)	JHF-06170(E)
Maximum Operating Pressure MPa{kgf/cm ² }		21{214}	25{255}	25{255}	21{214}
Pressure Compensation Differential Pressure MPa{kgf/cm ² }		1.0{10}	0.6{6}	1.4{14}	0.8{8}
Maximum Flow Rate ℓ/min		27	40	80	170
Weight kg		1.5	4.7	5.0	12

Explanation of model No.

JHF - 03 040 (E)



● Handling

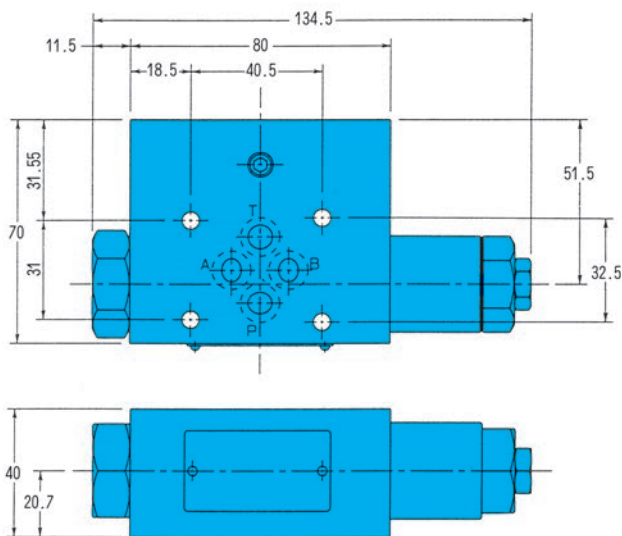
① When using the pressure compensation kit, use an external pilot type for the ESD valve (G03, 06).

② An internal pilot type pressure compensation valve kit is used when the pilot flow rate is supplied from the P port, without an external pilot port (Pp

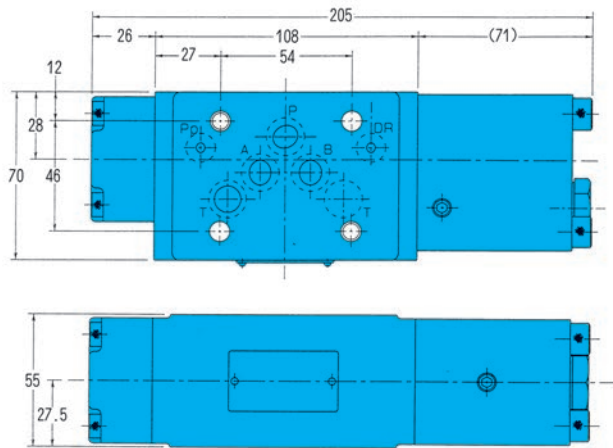
port) on the manifold. An external pilot type pressure compensation valve kit is used when there is an external pilot port (Pp port) on the manifold.

Installation Dimension Drawings

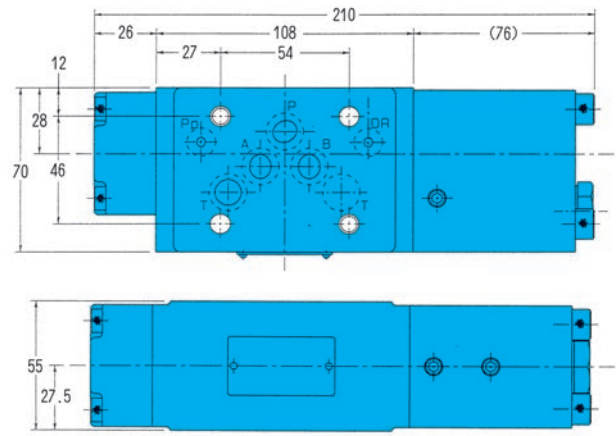
Pressure compensation valve kit
JHF-01027



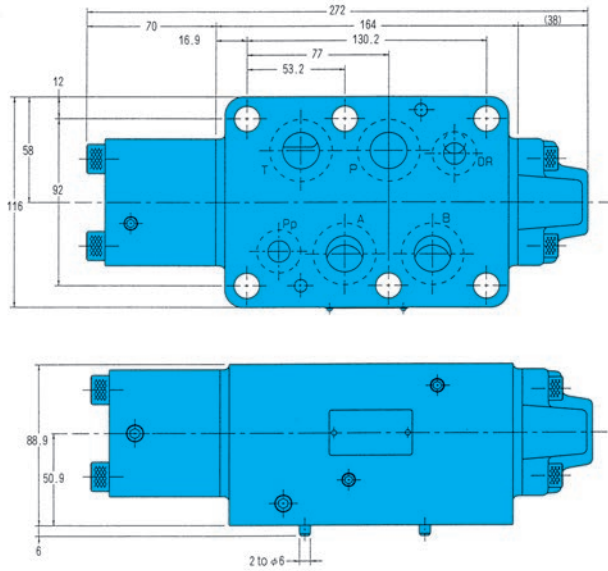
JHF-03040(E)



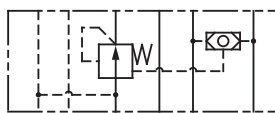
JHF-03080(E)



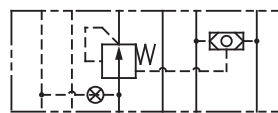
JHF-06170(E)



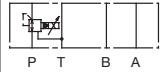
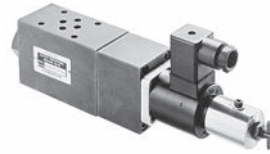
Note) Mounting bolts are not included with the pressure compensation kit.
Use the valve mounting bolt lists on pages D-93 through D-95 to select mounting bolts.



Internal pilot



External pilot



Modular Type Electro-hydraulic Proportional Reducing Valve

30ℓ/min
0.3 to 14MPa

Features

This valve incorporates the ease-of-use principles of the modular valve into an electro-hydraulic proportional reducing valve to provide reduction

control of hydraulic system pressure in proportion to input current. This valve is perfect for a small-scale hydraulic system, such as those used

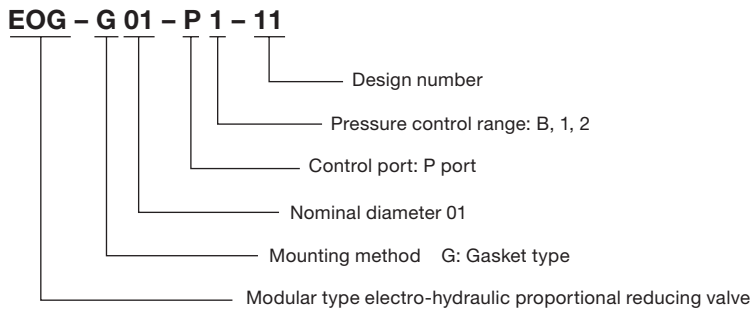
for continuous proportional control of lathe chuck pressure. A relief function ensures outstanding pressure response characteristics.

Specifications

Item	Model No.	EOG-G01-P*-11
Maximum Operating Pressure	MPa{kgf/cm ² }	25{255}
Maximum Flow Rate	ℓ/min	30
Pressure Control Range	MPa{kgf/cm ² }	B : 0.3 to 2.5{3.1 to 25.5} 1 : 0.4 to 7 {4 to 71 } 2 : 0.6 to 14 {6 to 143 }
T Port Allowable Back Pressure	MPa{kgf/cm ² }	2.5{25.5}max
Rated Current	mA	850
Coil Resistance	Ω	20 (20°C)
Hysteresis	%	3 max. (Note 1)
Weight	kg	3.6

Note) Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Explanation of model No.



● Handling

1 Air Bleeding

To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid

2 Manual Pressure Adjusting Screw

For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, valve pressure can be increased by rotating the manual adjustment screw clockwise (rightward). Normally, the manual adjusting screw should be rotated back fully to the left (counterclockwise) and secured with the lock nut.

3 Minimum Control Pressure

Since this valve has an internal drain system, T port back pressure has an effect on minimum control pressure.

4 Load Capacity

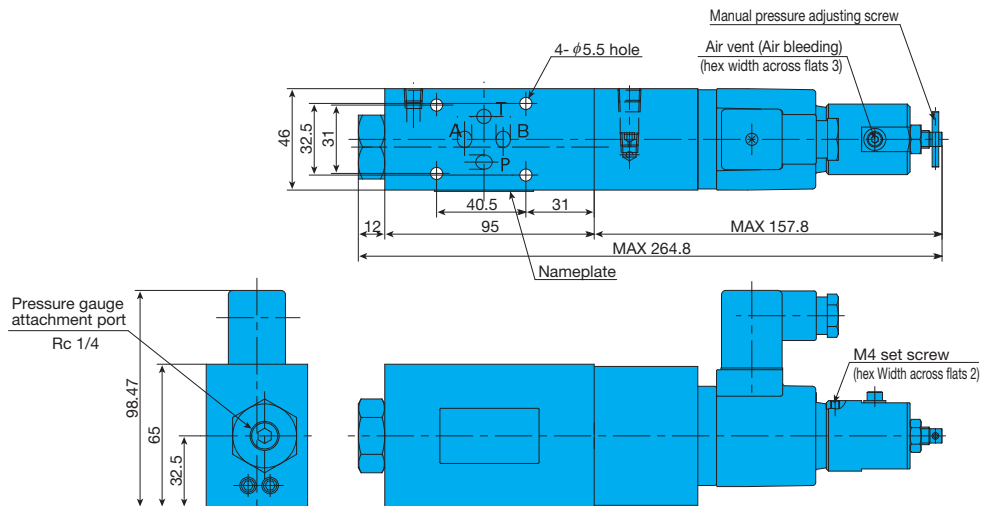
Make load capacity (valve OUT side capacity) at least 0.5ℓ.

5 Use an operating fluid that conforms to the both of the following.

Oil temperature : -20 to 70°C Kinematic Viscosity : 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

Installation Dimension Drawings

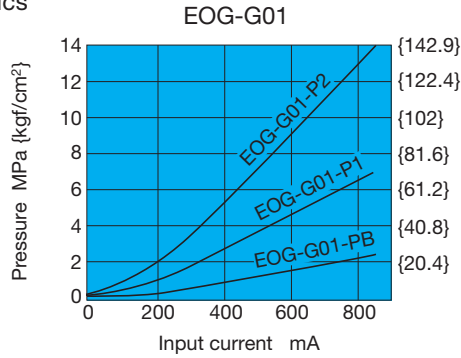
EOG-G01-P*-11



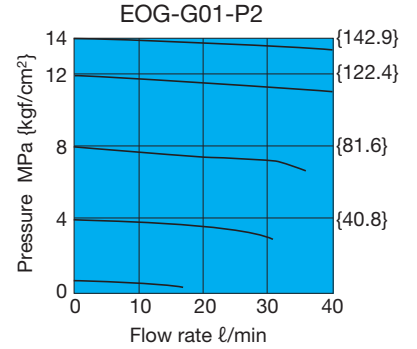
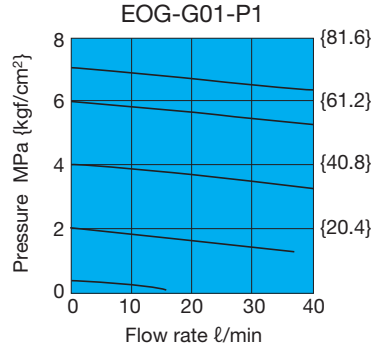
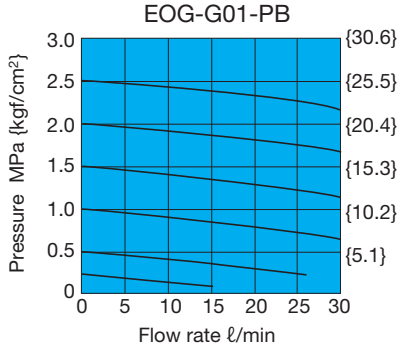
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

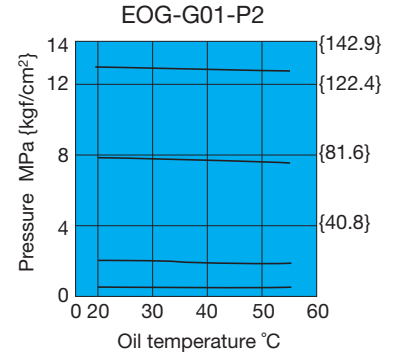
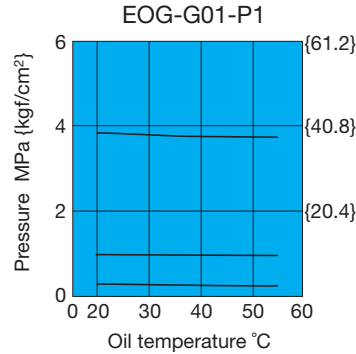
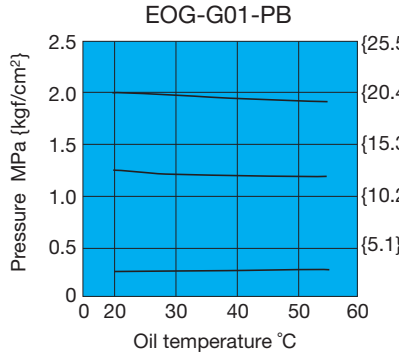
Input Current — Pressure Characteristics



Flow Rate — Pressure Characteristics

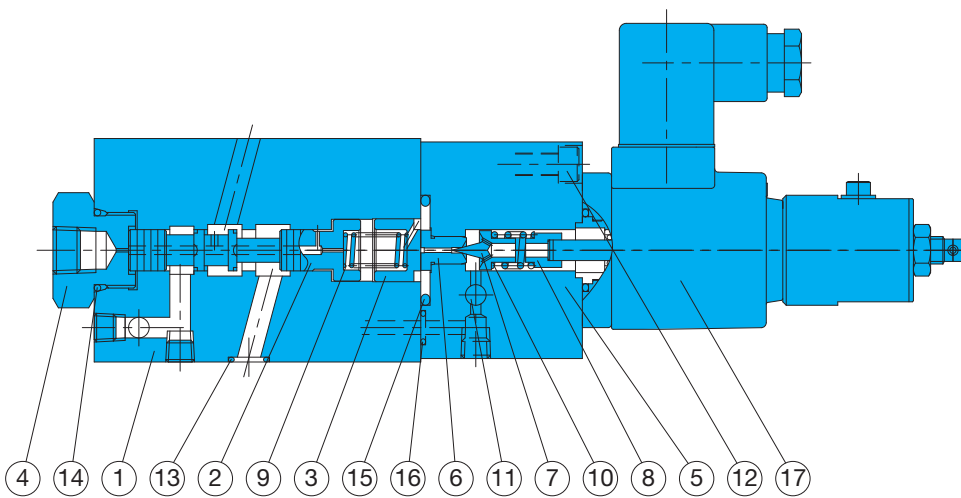


Oil Temperature Characteristics



Cross-sectional Drawing

EOG-G01-P*-11



Part No.	Part Name
1	Body
2	Spool
3	Retainer
4	Plug
5	Cover
6	Seat
7	Poppet
8	Retainer
9	Spring
10	Spring
11	Choke
12	Screw
13	O-ring
14	O-ring
15	O-ring
16	O-ring
17	Proportional solenoid

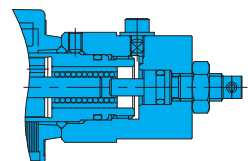
Note) Coil model number JD64-D2

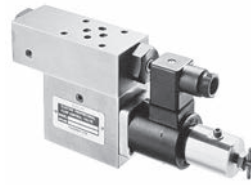
Seal Part List (Kit Model Number JBS-G01)

Part No.	Part Name	Part Number	Q'ty
13	O-ring	AS568-012(NBR-90)	4
14	O-ring	NBR-90 P20	1
15	O-ring	NBR-90 P26	1
16	O-ring	NBR-90 P7	1

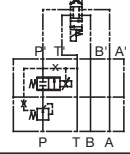
Note) The materials and hardness of the O-ring conforms with JIS B2401.

Manual adjustment section





EOF-G01-P25



Modular Type Electro-hydraulic Proportional Flow Control Valve

0.3 to 25ℓ/min
21MPa

Features

An electro-hydraulic proportional restrictor valve and pressure compensation valve are combined into a modular configuration, available as one of two types: the meter in control EOF-G01-P and meter out control EOF-G01-T.

The pressure fluctuations have little influence on the setting flow rate making this valve perfect for electro-hydraulic proportional control of small hydraulic systems used for machine tool APC and ATC high-speed shockless control, remote control, etc.

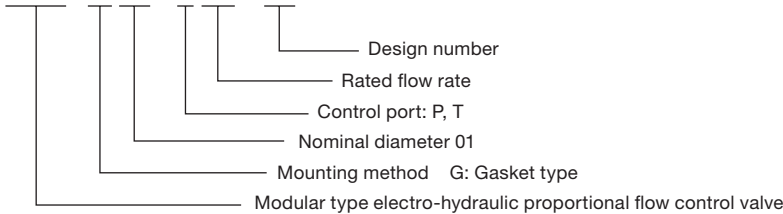
Specifications

Item	Model No.	EOF-G01- P T 25-11
Maximum Operating Pressure	MPa{kgf/cm ² }	21{214}
Flow Rate Control Range	ℓ/min	0.3 to 25
Flow Rate Control Port		EOF-G01-P : P port EOF-G01-T : T Port
T Port Allowable Back Pressure	MPa{kgf/cm ² }	2.5 {25.5} max.
Hysteresis	%	3 max. (Note 1)
Response Speed	S	0.05
Rated Current	mA	800
Coil Resistance	Ω	20 (20°C)
Weight	kg	3.7

Note) Value when a Nachi-Fujikoshi special amplifier is used (with dithering).

Explanation of model No.

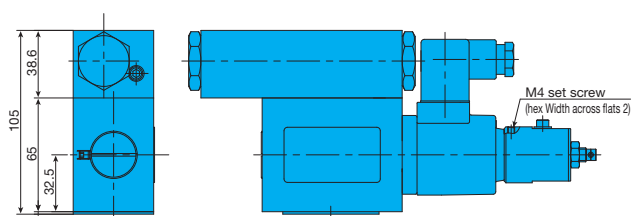
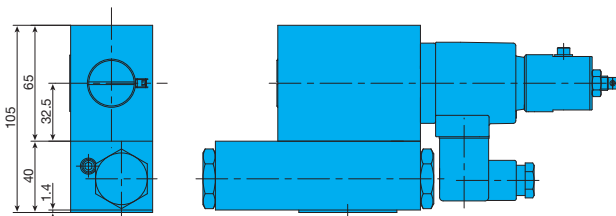
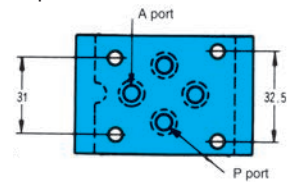
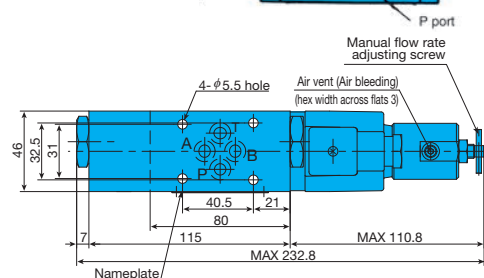
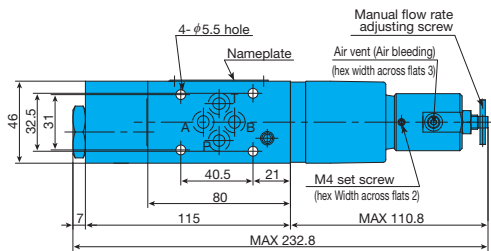
EOF - G 01 - P 25 - 11



Installation Dimension Drawings

EOF-G01-P25-11

EOF-G01-T25-11



● Handling

1 Air Bleeding

To enable proper pressure control, loosen the air vent when starting up the pump in order to bleed any air from the pump, and fill the inside of the solenoid with hydraulic operating fluid. The position of the air vent can change by loosening the lock screw and rotating the cover.

2 Manual flow rate adjusting screw

For the initial adjustment or when there is no input current to the valve due to an electrical problem or some other reason, the flow rate can be adjusted by rotating the manual adjustment screw. Rotate clockwise (rightward) to increase flow rate. Normally, this adjusting screw should be returned completely to its original position and secured with the lock nut.

3 T Port Back Pressure

Since this valve has an internal drain system, make sure that valve T port back pressure is no greater than 2.5MPa {25.5kgf/cm²}.

4 Use an operating fluid that conforms to the both of the following.

Oil temperature: -20 to 70°C Kinematic Viscosity: 12 to 400mm²/s. The recommended kinematic viscosity range is 15 to 60mm²/s.

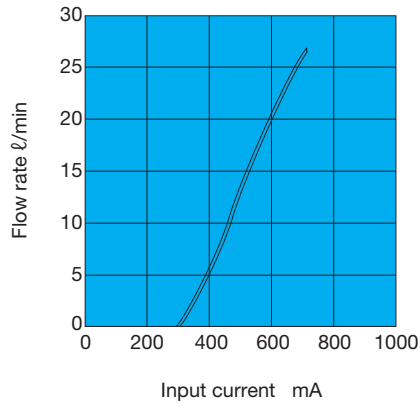
5 O-ring Plate Orientation

- ① The port nearest the nameplate surface is the P port.
- ② The port with a mounting pitch width of 31 (narrow pitch width) is the A port.
- ③ The cutout on the O-ring plate is on the A port side.

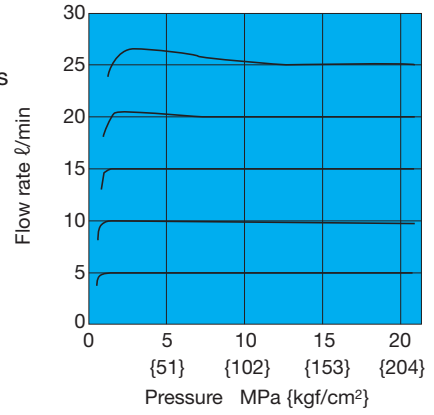
Performance Curves

Hydraulic Operating Fluid Kinematic Viscosity 32mm²/s

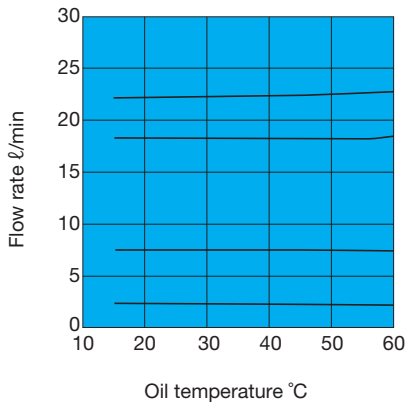
Input Current -
Flow Rate
Characteristics



Pressure -
Flow Rate
Characteristics

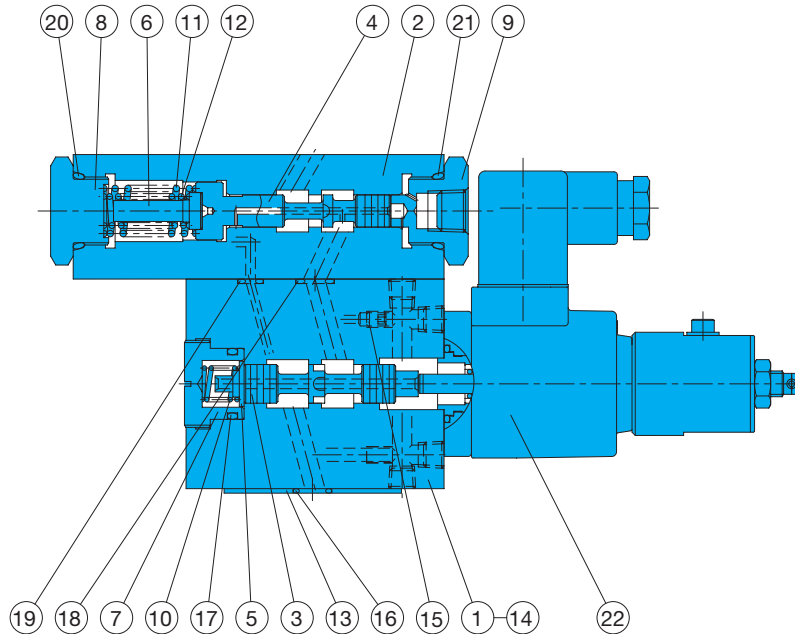


Oil Temperature
Characteristics



Cross-sectional Drawing

EOF-G01-T25



Part No.	Part Name
1	Body
2	Body
3	Spool
4	Piston
5	Retainer
6	Retainer
7	Plug
8	Plug
9	Plug
10	Spring
11	Spring
12	Spring
13	Plate
14	Screw
15	Screw
16	O-ring
17	O-ring
18	O-ring
19	O-ring
20	O-ring
21	O-ring
22	Proportional solenoid

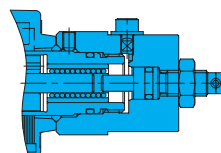
Note) Coil model number JD64-D2

Seal Part List (Kit Model Number JMS-G01)

Part No.	Part Name	Part Number	Q'ty
16	O-ring	AS568-012(NBR-90)	4
17	O-ring	NBR-90 P18	1
18	O-ring	NBR-90 P9	4
19	O-ring	NBR-90 P5	1
20	O-ring	NBR-90 P20	1
21	O-ring	NBR-90 P20	1

Note) The materials and hardness of the O-ring conforms with JIS B2401.

Manual adjustment
section





Power Amplifier Series for Electrohydraulic Proportional Valve Drive

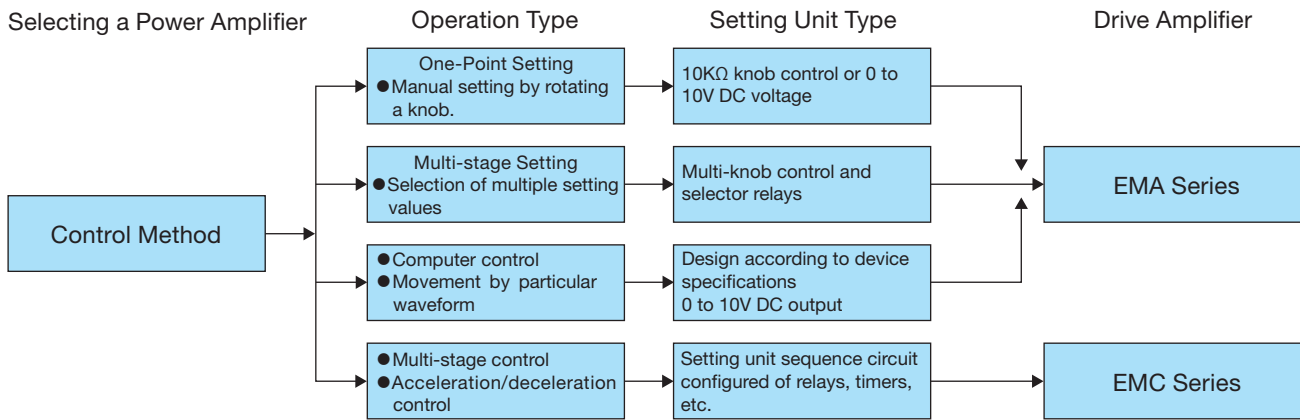
Overview

This special amplifier is for driving electro-hydraulic proportional pressure control valves, electro-hydraulic proportional flow control valves, and electro-hydraulic proportional direction control valves. It comes in a choice of two different types: an amp type and a controller type. Basically, the amp type converts 0 to 10V DC range command voltage to a DC current in the range of 0 to 900mA, which is then supplied to the control valve. The control type performs multi-stage control of output current in accordance with the ON-OFF signal of external contacts.

Power Amplifier Types and Functions

Type	Model No.	Drive Control Valve	Functions
Amp Type	EMA-PD5-N-20	Pressure Control Valves Flow Control Valves Direction Control Valves	Three functions: open loop control, feedback control, and acceleration/deceleration control.
Controller Type	EMC-PC6-A-20	Same as above.	Built-in command voltage setting units (potentiometers) Setting unit selection is performed by relay contacts, limit switches, timer contacts, etc.

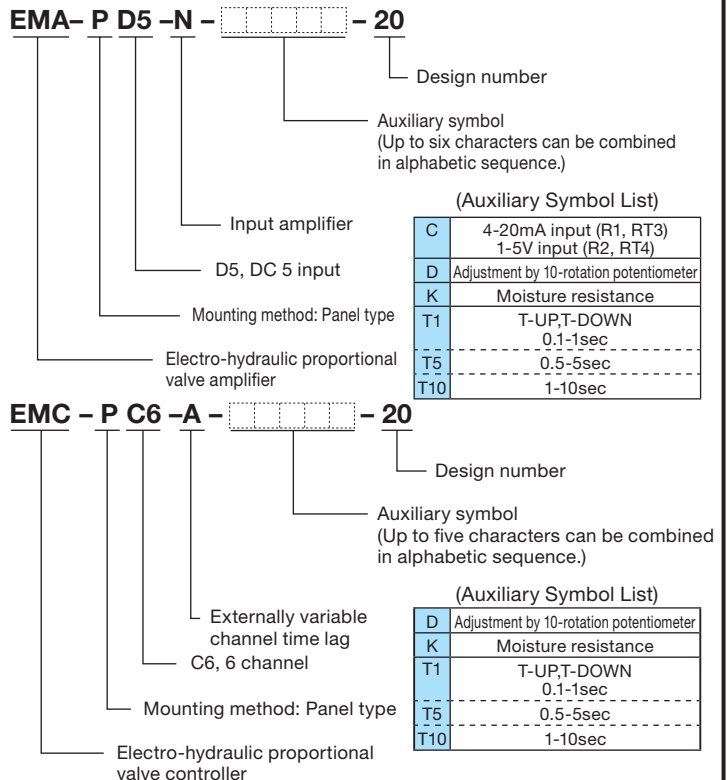
Selecting a Power Amplifier



Specifications

Item	Model No.	EMA-PD5-N-20	EMC-PC6-A-20
Function		Amp Type (Closed Loop)	Controller Type
Number of Inputs		5 DC inputs	-
Number of Channels		-	6
Maximum Output Current		900mA (20Ω solenoid)	900mA (20Ω solenoid)
Input voltage		0 to +10V DC	-
Feedback Voltage		0 to +10V DC	-
Input Impedance		At least 50kΩ	-
Externally Set Variable Resistance		10kΩ	-
Zero Adjust(NULL)		0 to 900mA	0 to 900mA
Time Lag (T-UP, DOWN)		0.3 to 3sec	-
Gain Adjustment (GAIN)		$\frac{900mA}{10V_{DC}}$ to $\frac{900mA}{1.5V}$	0 to $\frac{900mA}{80\% \text{ channel setting}}$
External power supply		+10V _{DC} (10mA)	-
External Contact Resistance		-	10Ω max. when closed
Dither (Internal, semi-fixed)		Level: 0 to 500mAp-p Frequency: 50 to 220Hz	Level: 0 to 500mAp-p Frequency: 50 to 220Hz
Channel Time Lag (TIME)		-	0.3 to 3 seconds Externally variable
Power Supply Voltage		AC100, 110, 200, 220V (±10%)50/60Hz	AC100, 110, 200, 220V (±10%)50/60Hz
Power Consumption		50VA	50VA
Allowable Ambient Temperature		0 to 50°C	0 to 50°C
Temperature Drift		0.2mA/°C max.	0.2mA/°C max.
Weight		3.5kg	3.5kg

Explanation of model No.



Note: T-UP, DOWN, and TIMER all become 0.3-3 sec when there is no signal for T1, T5, and T10.

● Handling

- Power supply voltage can be either 100V or 200V.
- When selecting a location, avoid areas subject to high temperatures and high

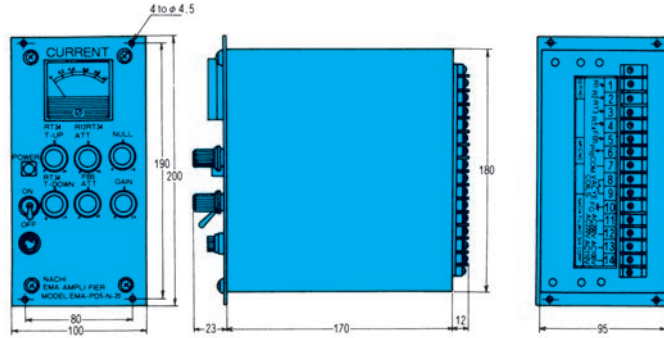
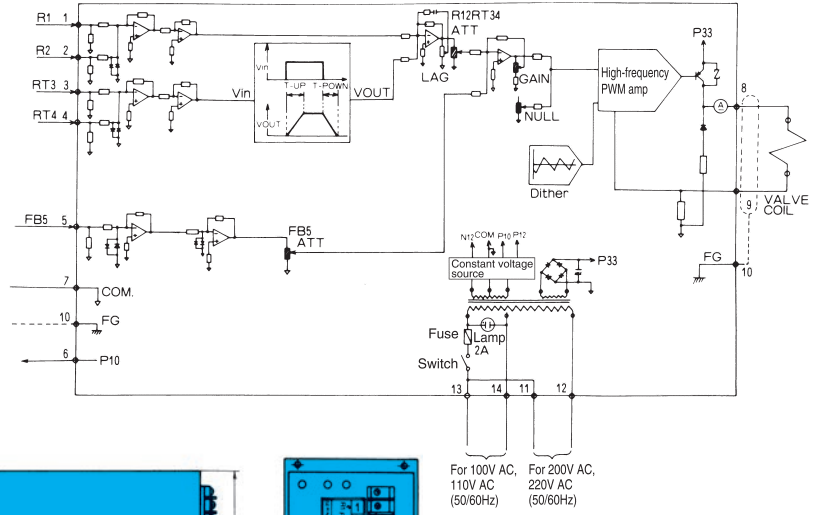
humidity, and select an area where there is little vibration and dust.

- Use shielded wire for the analog signal and valve output signal wires.

- When performing valve output signal line ON-OFF switching with a relay, connect a surge absorber or varistor parallel with the relay.

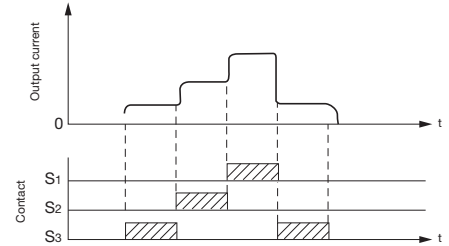
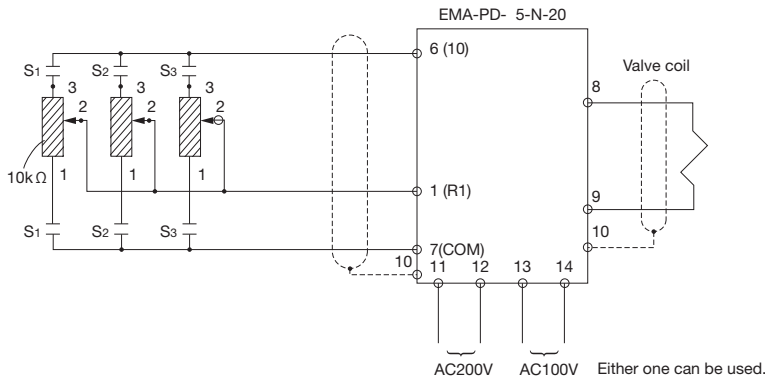
Power Amplifier Series for Electro-hydraulic Proportional Valve Drive
EMA-PD5-N-20

No.	Name	No.	Name
1	R1, Input	8	Output terminal to VALVE COIL valve
2	R2, Input	9	FG, case ground
3	RT3, delay input	10	AC200, 220V
4	RT4, delay input	11	AC100, 110V
5	FB5, feedback input	12	
6	P10, external power supply	13	
7	COM, signal land	14	



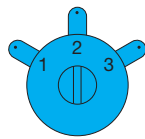
Application Examples

① Multi-stage Setting Using Multiple Potentiometers



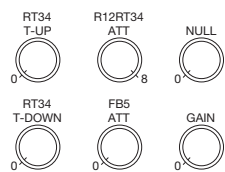
(1) Wiring the amp and external potentiometer

A potentiometer has three terminals numbered 1, 2, and 3.



(2) Setting the adjusting knobs
Terminals 2 (R2), 3 (RT3), and 4 (RT4) can also be used in place of terminal 1. An RT34T-UP and RT34T-DOWN acceleration/deceleration timer can also be used in the case of terminal 3 (RT3) and terminal 4 (RT4).

In this case, the settings of the knobs on the front panel of the amp are normally as shown in the illustration below.



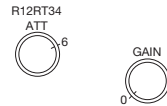
The manual setting unit provides output current control in the range of 0 to 900mA as it is rotated from full counterclockwise to full clockwise.

Wiring

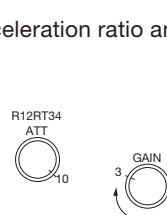
- Amp terminal 7 (0V) Potentiometer terminal 1
- Amp terminal 6 (10V) Potentiometer terminal 3
- Amp terminal 1 (R1) Potentiometer terminal 2

With this wiring, rotating the potentiometer clockwise causes the output current to increase.

① If an output in the range of 0 to 600mA is desired even while the manual setting unit is rotated fully clockwise, restrict the setting of R12RT34ATT to 6.



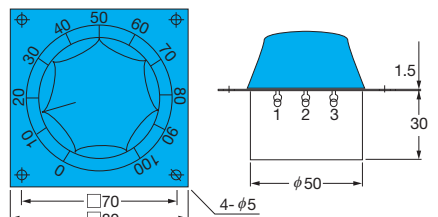
② When the level deceleration ratio and other factors limit the effective use of the manual setting unit to only 150° of the 300°, use GAIN to adjust the output current to 900mA.



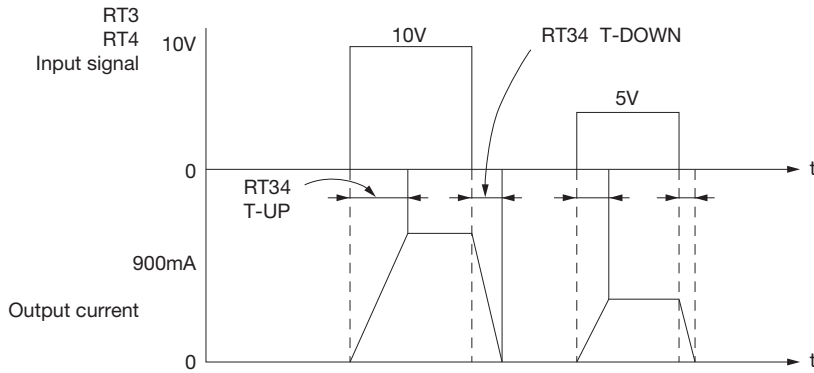
- Note) 1. A range of 5KΩ to 10KΩ is recommended for external knobs and potentiometers.
2. In order to prevent current loss across terminals 6 and 7, insert relays between terminal 6 and the potentiometers and terminal 7 and the potentiometers.
3. Do not enable more than one potentiometer at the same time.

(3) The following is available for the external setting knob.

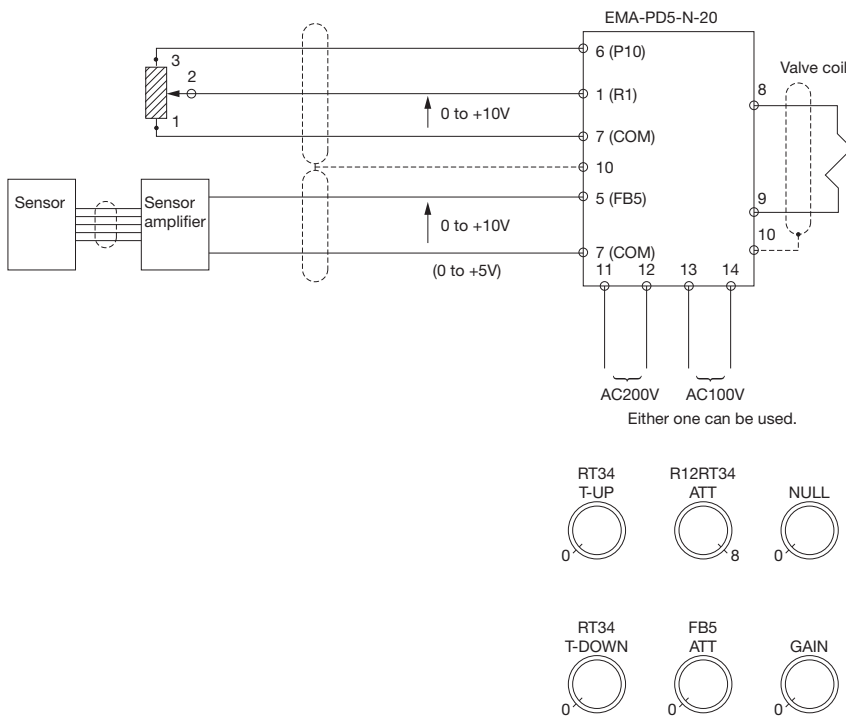
Model No. FZS-6350-101



(4) Acceleration time adjustment (RT34T-UP) and deceleration time adjustment (RT34T-DOWN)



② Feedback Control.



This circuit creates a fixed acceleration time lag in accordance with the voltage that added the input signal to terminals 3 and 4 (RT3, RT4). The time lag is adjustable in the range of 0.3 to 3 seconds, as standard. As shown in the diagram to the left, even when RT34T-UP is set to 3 seconds, the change to 5V during stepped input from 0 to 10V and stepped input from 0 to 5V takes 1.5 seconds, which is half the set time.

With the wiring shown to the left, output current is increased or decreased in accordance with the feedback signal of the sensor, which regulates pressure or the flow rate.

Note)

Using terminal 3 (RT3) and terminal 4 (RT4) in place of terminal 1 (R1) enables T-UP and T-DOWN, which allows feedback control without overshooting or undershooting, even when input signal voltage is stepped.

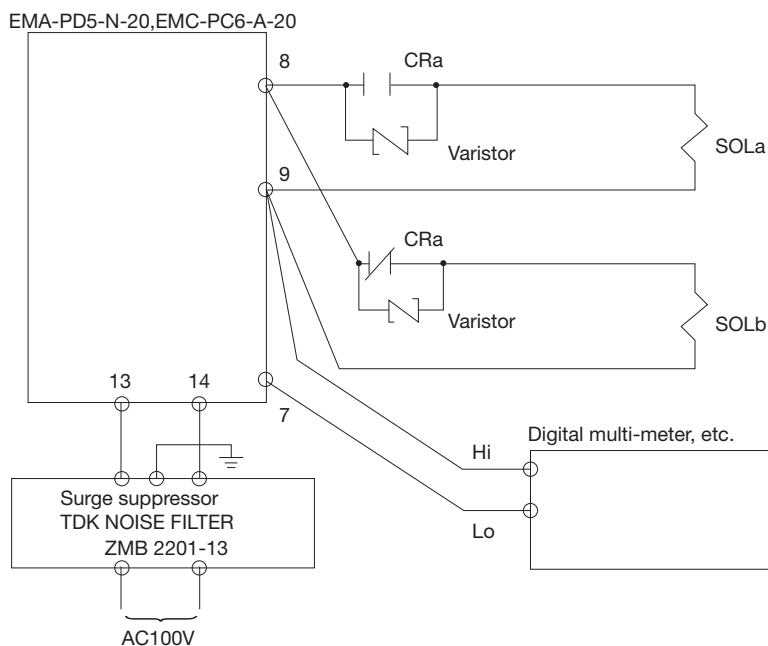
Adjustment Method

- Initially, set FB5ATT to 0 as shown in the illustration to the left, and check to see if open loop control is possible.
- Next, set FB5ATT to 2 and GAIN to 2, and input a feedback signal. Gradually rotate FB5ATT clockwise and increase gain. Set the feedback gain to the level that is immediately before the point where vibration is generated in the control system. (FB5ATT, GAIN)

Note)

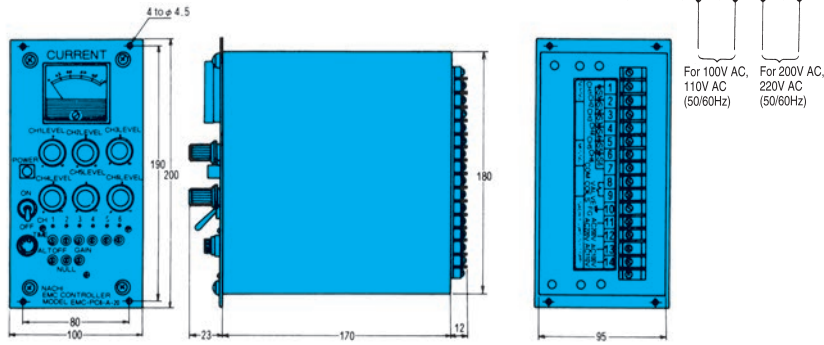
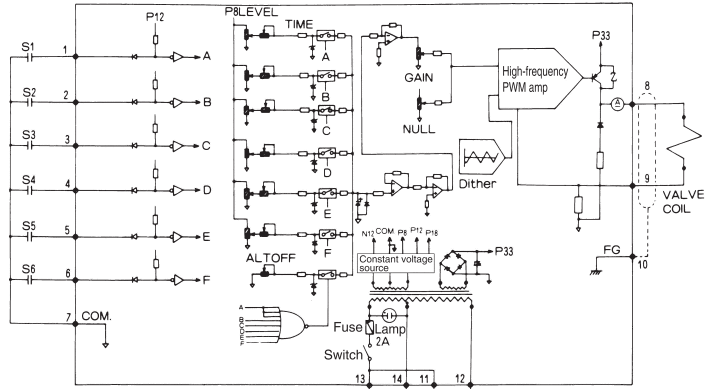
- To measure current, measure the voltage at terminal 9, using terminal 7 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.
- Switch the terminal 8 line using a relay. Make sure that both relays are not on at the same time.
- To absorb surge voltage, include 82V varistors in parallel with the relay contacts.
Recommended Varistor
KOA NVD10SCD082
Panasonic ERZV10D820
- For relays, use OMRON LY type power relays or the equivalent.
- Too much noise in the 100V AC or 200V AC power supply line can result in unstable output current. If this happens, equip a surge absorber on the power supply.
Recommended Model
TDK NOISE FILTER
ZMB2201-13

③ Direction Control Valve (ESD) Drive



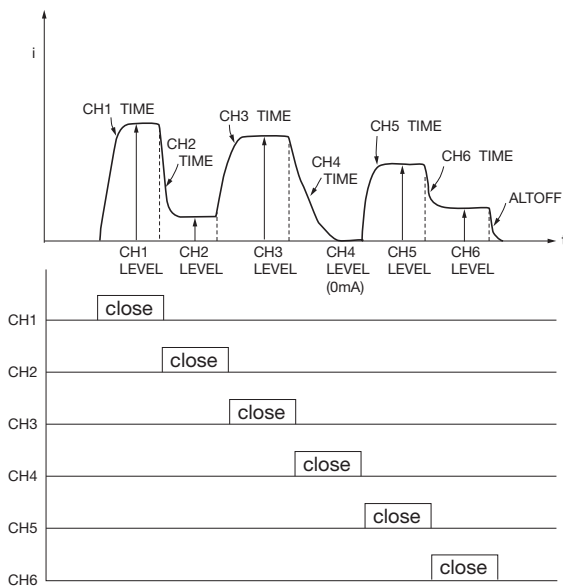
Power Amplifier Series for Electrohydraulic Proportional Valve Drive
EMC-PC6-A-20

No.	Name	No.	Name
1	CH1 Input command contact	8	Output terminal to valve
2	CH2 "	9	VALVE COIL
3	CH3 "	10	FG, case ground
4	CH4 "	11	AC200 220V
5	CH5 "	12	AC100 110V
6	CH6 "	13	AC100 110V
7	Common COM input contact	14	



Note) When external contacts S1 through S6 are closed, use a non-voltage contact no greater than 10Ω.

Application



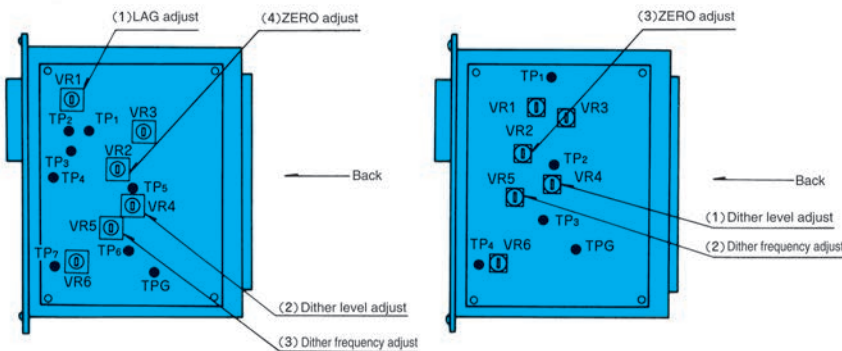
- LEDs are provided to indicate channel selection.
- The TIME knob of each channel adjusts the time until the selected channel's level is reached, as shown to the left. Make sure that the lap time (or time when channel is not selected) when changing the channel selection is 30msec maximum.
- Use independent external contacts. Even when external contacts are superimposed, output is not the sum of each channel, so use of superimposed external contacts is not supported.

Note) When replacing a Design Number 10 controller with a Design Number 20 controller, you must also change the sequence from superimposed external contacts to independent.

Dither Adjustment Method (Dither is set to load 400mA_{p-p}, 100Hz.)

(1) EMA-PD5-N-20

(2) EMC-PC6-A-20



Removing the left side panel when viewed from the front reveals the configuration shown in the illustrations to the left.

- ① If piping or other items vibrate in response to the dither, raise the dither frequency by rotating the trimmer clockwise.
- ② When repeat stability is poor and the hysteresis is large, increase the dither level by rotating clockwise. If this does not resolve the problem, lower the dither frequency by rotating the trimmer counterclockwise.
- ③ When repeatability is poor with the ES valve or ESD valve due to insufficient air bleeding within the guide, raise the dither frequency by rotating the trimmer clockwise, as described in ①.



Small Type Power Amplifier Series for Electro-hydraulic Proportional Valve Drive

Features

This power amplifier provides high efficiency and reliability in a compact configuration.

Lightweight, compact design –The configuration of this amplifier is 1/3 the weight and 1/2 the volume of existing models.

High efficiency –A PWM control system enables a highly efficient design with little heat generation.

High reliability –All functions are integrated onto a single circuit board for a highly reliable design with no internal wiring.

Specifications

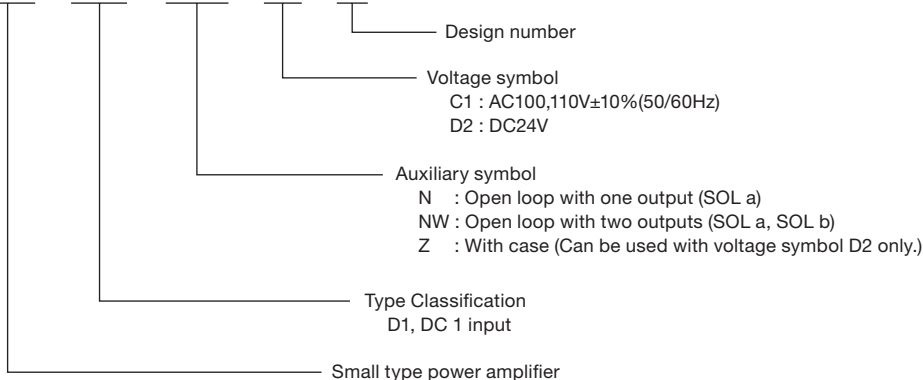
Item	Model No.	EBA-PD1-N-C1-10	EBA-PD1-NW-C1-10	EBA-PD1-N(Z)-D2-10	EBA-PD1-NW(Z)-D2-10
Function		Amp Type (Open Loop)	Amp Type (Open Loop)	Amp Type (Open Loop)	Amp Type (Open Loop)
Number of Inputs		1 DC inputs	1 DC inputs	1 DC inputs	1 DC inputs
Drive Solenoid		SOL a	SOL a, SOL b	SOL a	SOL a, SOL b
Maximum Output Current		900mA (20Ω solenoid)	900mA (20Ω solenoid)	900mA (20Ω solenoid)	900mA (20Ω solenoid)
Input voltage		0 to +10V DC	-10 to +10V DC	0 to +10V DC	-10 to +10V DC
Input Impedance		50kΩ	50kΩ	50kΩ	50kΩ
Externally Set Variable Resistance		10kΩ	10kΩ	10kΩ	10kΩ
Zero Adjust		0 to 900mA	0 to 900mA	0 to 900mA	0 to 900mA
Gain Adjustment		0 to $\frac{900\text{mA}}{5\text{V input}}$	0 to $\frac{900\text{mA}}{5\text{V input}}$	0 to $\frac{900\text{mA}}{5\text{V input}}$	0 to $\frac{900\text{mA}}{5\text{V input}}$
External power supply		+5V DC (5mA)	+5V DC (5mA) -5V DC (5mA)	+5V DC (5mA)	+5V DC (5mA) -5V DC (5mA)
Dither Frequency		Variable: 80 to 220Hz	Variable: 80 to 220Hz	Variable: 80 to 220Hz	Variable: 80 to 220Hz
Time Lag		Internally Variable: 0.05 to 2 seconds	Internally Variable: 0.05 to 2 seconds	Internally Variable: 0.05 to 2 seconds	Internally Variable: 0.05 to 2 seconds
Power Supply Voltage		AC100 · 110V±10% (50/60Hz)	AC100 · 110V±10% (50/60Hz)	DC24V (DC24 to 30V)	DC24V (DC24 to 30V)
Power Consumption		30VA	30VA	30VA	30VA
Allowable Ambient Temperature		0 to 50°C	0 to 50°C	0 to 50°C	0 to 50°C
Temperature Drift		0.2mA/°C max.	0.2mA/°C max.	0.2mA/°C max.	0.2mA/°C max.
Weight		2.2kg	2.2kg	0.14kg (0.6kg with Z)	1.14kg (0.6kg with Z)
Driven Valve		Pressure Control Valves Flow Control Valves	Direction Control Valve	Pressure Control Valves Flow Control Valves	Direction Control Valve

● Handling

- 1 When selecting a location, avoid areas subject to high temperatures and high humidity, and select an area where there is little vibration and dust.
- 2 Use shielded wire for the analog signal and valve output signal wires.
- 3 The brightness of the LED changes in accordance with the size of the output current.

Explanation of model No.

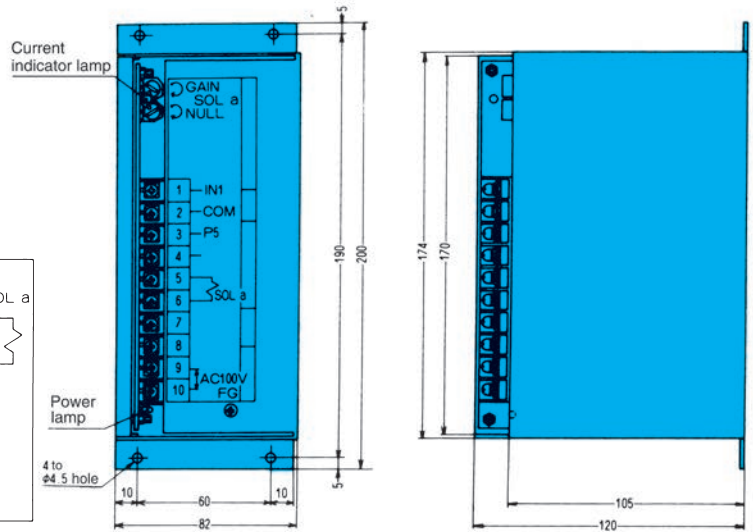
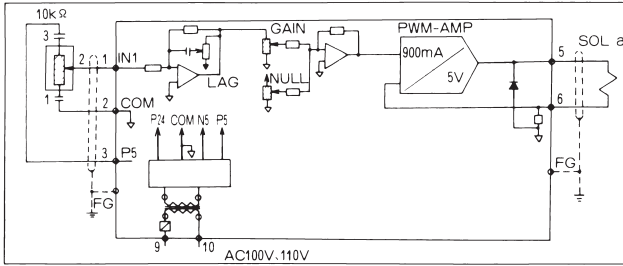
EBA - PD1 - NWZ - D2 - 10



Installation Dimension Drawings

EBA-PD1-N-C1-10

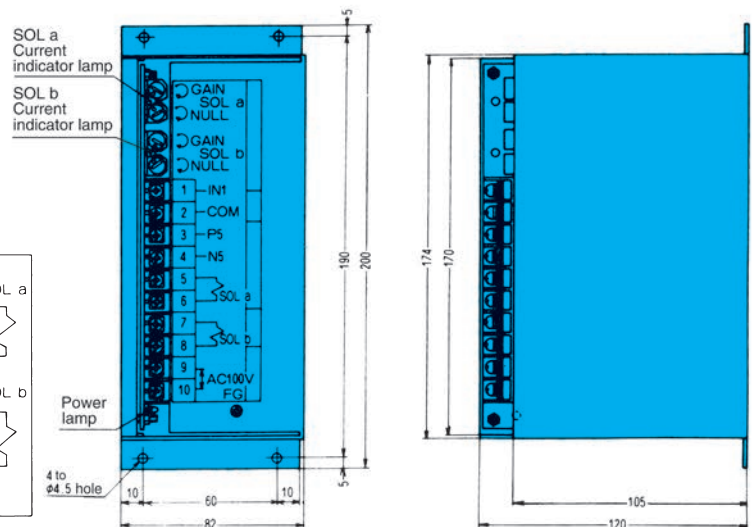
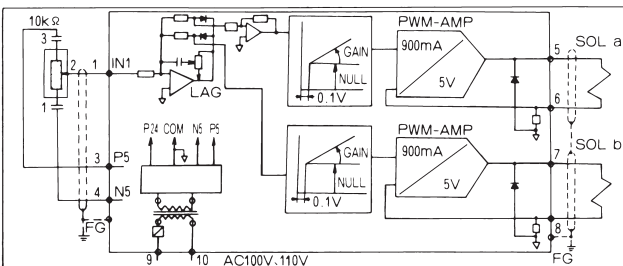
No.	Name	No.	Name
1	Input signal terminal IN1	5	Output terminal to valve SOL a
2	Input signal terminal COM	6	
3	External power supply P5	7	
		8	
		9	
		10	AC100 · 110V



- With EBA-PD1-N (Z), current is supplied to the control valve in proportion to input signal voltage in the range of 0 to +10V.
- To measure current, measure the voltage at terminal 6, using terminal 2 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Input impedance of the measurement device should be at least 1MΩ.
- With EBA-PD1-NW (Z), the polarity of the input voltage is determined, and current is supplied to SOLa when it's positive and to SOLb when it is negative.
- NULL and GAIN for SOL a and SOL b are enabled when each of their input signal voltage is ±0.1V or more.

EBA-PD1-NW-C1-10

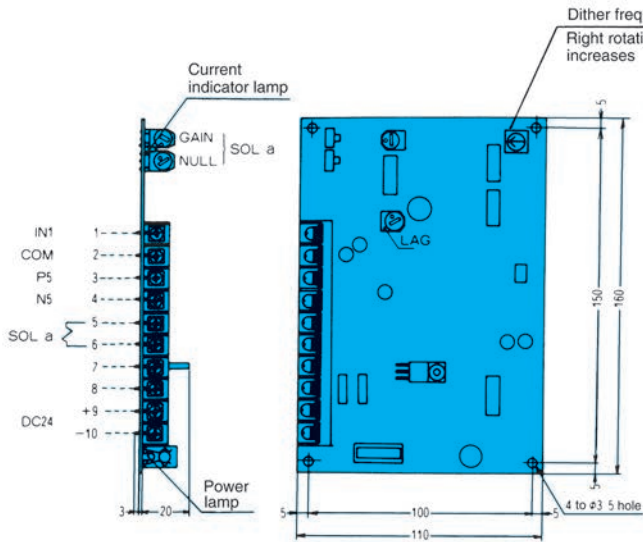
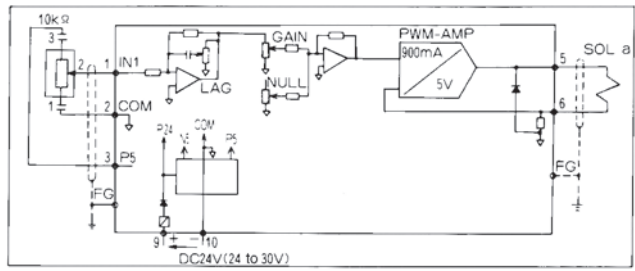
No.	Name	No.	Name
1	Input signal terminal IN1	5	Output terminal to valve SOL a
2	Input signal terminal COM	6	
3	External power supply P5	7	Output terminal to valve SOL b
4	External power supply N5	8	
		9	
		10	AC100 · 110V



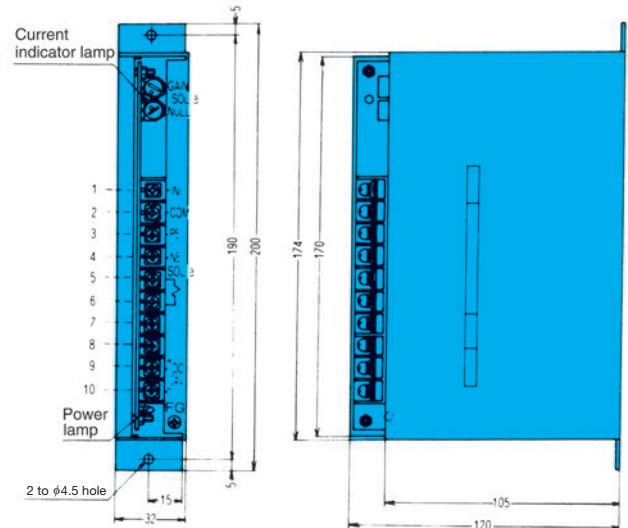
- To measure current, measure the voltage at SOLa terminal 6 and SOLb terminal 6, using terminal 2 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Input impedance of the measurement device should be at least 1MΩ.

EBA-PD1-N(Z)-D2-10

No.	Name	No.	Name
1	Input signal terminal IN1	5	Output terminal to valve SOL a
2	Input signal terminal COM	6	
3	External power supply P5	7	
		8	
		9	+ DC24V
		10	- DC24V



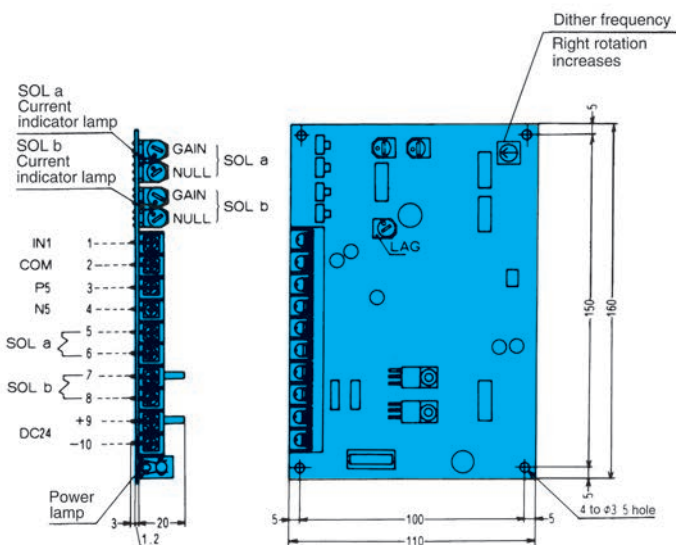
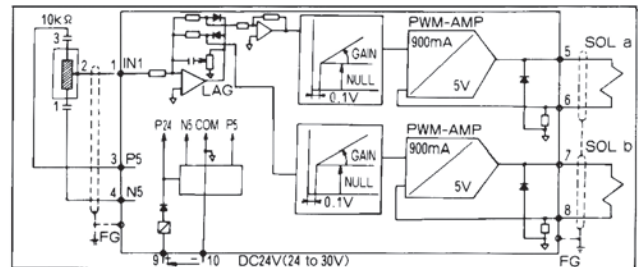
EBA-PD1-N-D2-10



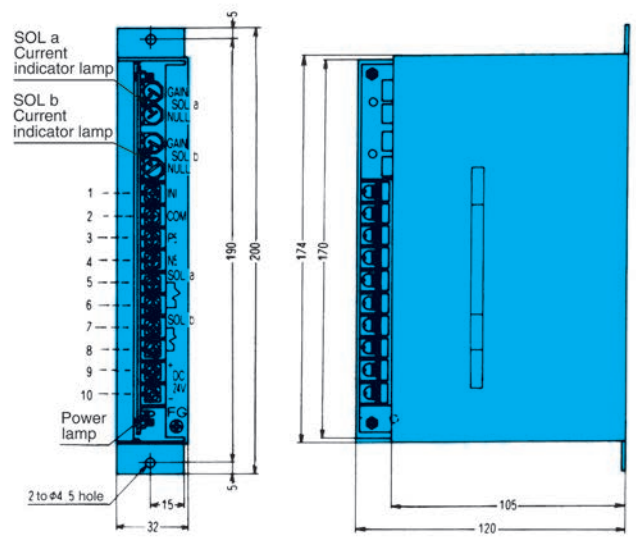
EBA-PD1-NZ-D2-10

EBA-PD1-NW(Z)-D2-10

No.	Name	No.	Name
1	Input signal terminal IN1	5	Output terminal to valve SOL a
2	Input signal terminal COM	6	
3	External power supply P5	7	Output terminal to valve SOL b
4	External power supply N5	8	
		9	+ DC24V
		10	- DC24V



EBA-PD1-NW-D2-10



EBA-PD1-NWZ-D2-10

Note) Use a 24V switching regulator with a capacitance of at least 1A.

Example

Manufacturer	Model No.	Capacity
COSEL	R25A-24	24V 1.1A
TDK	EAK24-1R3G	24V 1.3A
DENSEI-LAMBDA	EWS25-24	24V 1.2A

● General Precautions

① Measuring current flow in the solenoid coil

As shown in the illustration below, disconnect the line supplying current to the solenoid coil, and then insert a 1A DC rated current meter or measure voltage across terminals 5 and 6.

Solenoid coil resistance is 20Ω, so the relationship between voltage and current is as shown below. Note, however, that these values are not exact, because coil resistance changes with

Voltage (V)	Current (mA)
0	0
4	200
8	400
12	600
16	800

temperature.

Measurements across terminals 7 and 8 can be performed the same as shown in the illustration below.

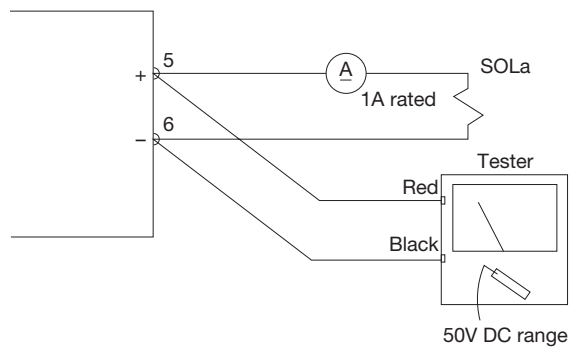
② Never energize only the solenoid coil.

The amp will not operate correctly if the iron coil is not inserted.

③ For connection between the amp/controller and solenoid coil, use a 2-conductor shielded wire with a conductor nominal cross-section area of 2.0mm². Type VCTF (Rated Voltage: 300V vinyl cab tire cord).

Wiring between the command voltage generator and amplifier should be VCTF 0.75m² 3-conductor wire.

Use a shield that conforms to JIS Class 3 grounding. If the ground line is unstable, do not connect the shield to anything.



Power Amplifier Operation and Terminology

① Zero Adjust (NULL)

This knob sets the lower limit of the operating pressure and flow rate.

Rotating it clockwise increases the output current. This knob is also used for manual control while checking valve operation.

③ Channel Time Lag (TIME)

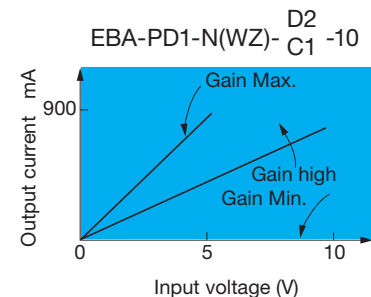
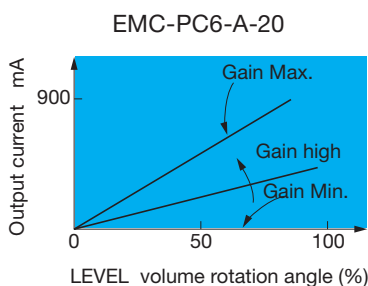
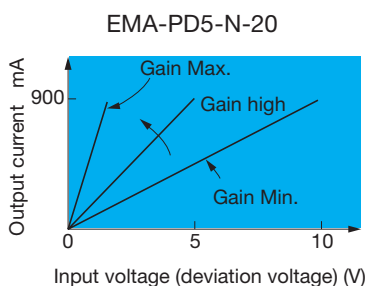
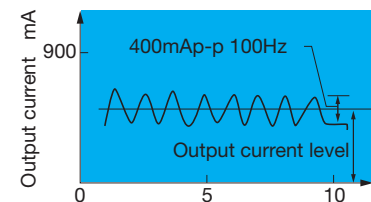
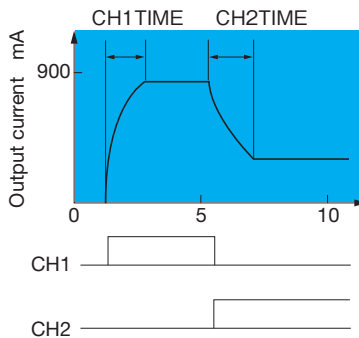
This knob adjusts the time it takes for a channel selected by external contact to reach its channel level. Rotating it clockwise increases the time lag.

④ Dither

Dither plays a role in improving control valve hysteresis, response, stability, etc.

② Gain Adjust (GAIN)

This knob adjusts output current in proportion to input signal voltage or the channel level knob rotation angle. Rotating it clockwise increases gain.





Small Type Multi-function Power Amplifier

Features

This compact, multi-function power amplifier uses advanced hybrid integrated circuits (HIC).

- Compact design** — Less than half the size of previous models
- High reliability** — Circuit board configuration eliminates the need for wiring.
- Multi-function** —
 - Simultaneous driving of two valves
 - Controller with built-in amplifier (EDC-PC6-AWZ-D2-20)
 - Dither frequency selection function (From Designs 11, 20)

Specifications

Item	Model No.	EDA-PD1-NWZ-D2-11	EDC-PC6-AWZ-D2-20
Function		Amp Type	Amp/Controller Type
Input type		1 DC inputs	Contacts, 6 inputs, DC 2 inputs
Maximum Output Current		900mA (20Ω solenoid)	900mA (20Ω solenoid)
Input voltage		-10 to + 10VDC	0 to + 10VDC
Input Impedance		50kΩ	50kΩ
Externally Set Variable Resistance		10kΩ	10kΩ
Drive Solenoid		SOL a, SOL b	SOL 1, SOL 2
Zero Adjust (NULL)		0 to 900mA	0 to 900mA
Gain Adjust (GAIN)		0 to $\frac{900\text{mA}}{2.5\text{V}}$	0 to $\frac{900\text{mA}}{2.5\text{V}}$
External power supply		+ 5VDC (5mA) - 5VDC (5mA)	+ 5VDC (10mA)
Time Lag (LAG)		0 to 2sec	0 to 2sec
Dither Frequency (DITHER)		80 to 250Hz	80 to 250Hz
Power Supply Voltage		DC24V (DC22 to 30V)	DC24V (DC22 to 30V)
Power Consumption		30VA	60VA
Allowable Ambient Temperature		0 to 50°C	0 to 50°C
Temperature Drift		0.2mA/°C max.	0.2mA/°C max.
Weight		0.3kg	0.4kg
Driven Valve		Pressure, flow, direction control valves	Pressure, flow, direction control valves

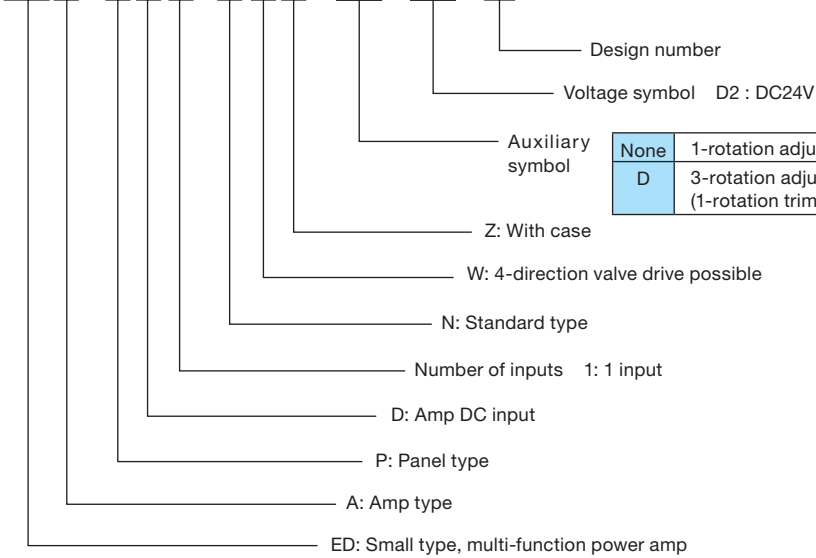
● Handling

- ① When selecting a location, avoid areas subject to high temperatures and high humidity, and select an area where there is little vibration and dust.
- ② Use shielded wire for the analog signal and valve output signal wires. See page I-33 for general precautions.
- ③ The brightness of the LED changes in accordance with the size of the output current.

Explanation of model No.

(1) Amp Type

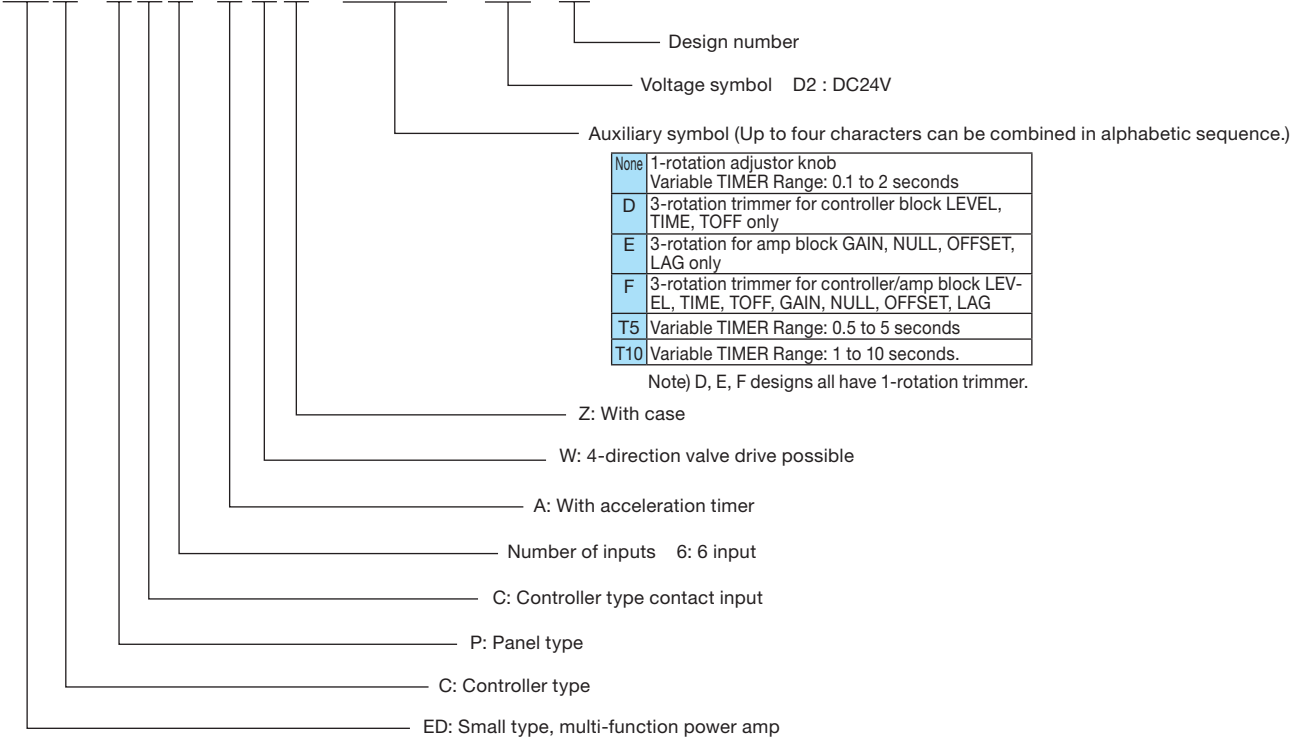
ED A - P D 1 - N W Z - () - D2 - 11



None	1-rotation adjustor knob
D	3-rotation adjustor knob (1-rotation trimmer for dither)

(2) Amp/Controller Type

ED C - P C 6 - A W Z - () - D2 - 20



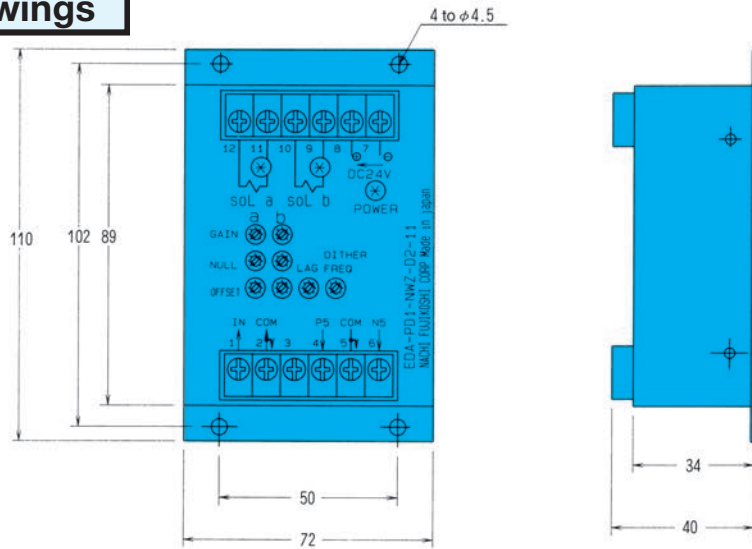
None	1-rotation adjustor knob Variable TIMER Range: 0.1 to 2 seconds
D	3-rotation trimmer for controller block LEVEL, TIME, TOFF only
E	3-rotation for amp block GAIN, NULL, OFFSET, LAG only
F	3-rotation trimmer for controller/amp block LEV- EL, TIME, TOFF, GAIN, NULL, OFFSET, LAG
T5	Variable TIMER Range: 0.5 to 5 seconds
T10	Variable TIMER Range: 1 to 10 seconds.

Note) D, E, F designs all have 1-rotation trimmer.

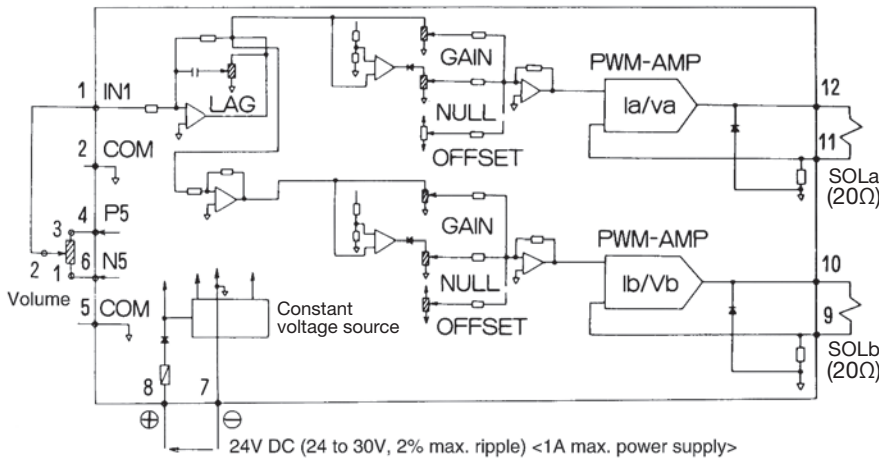
Installation Dimension Drawings

EDA-PD1-NWZ-D2-11

No.	Name	No.	Name
1	Input signal terminal IN1	7	- DC24V
2	Input signal terminal COM	8	+
3		9	Output terminal to valve
4	External power supply P5	10	SOL b
5	Input signal terminal COM	11	Output terminal to valve
6	External power supply N5	12	SOL a



Block Diagram

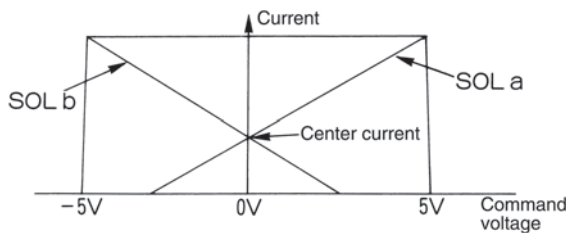


- Current is supplied to SOL a when input signal voltage polarity is positive, and to SOL b when negative. Either SOL a or SOL b can be driven at any one time.
- Push-pull drive is also supported.
- To measure current, measure the voltage at SOL a terminal 11 and SOL b terminal 9, using terminal 5 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least $1\text{M}\Omega$.
- To use SOL a only, connect terminal 1 of the knob to amp terminal 2, use an input voltage range of 0 to 5V. (ER, ES only)

Application Examples

1) Adjusting Push-pull Drive for a Special Proportional Valve (Special Specification Direction Control Valve)

- Overlap Type Proportional Valve ESD-G01-C5₂₀¹⁰-6333D...300mA(Center Current)
- Zero-Lap Type Proportional Valve ESD-G01-C5₂₀¹⁰-6586C...200mA(Center Current)



As shown in the figure to the left, push-pull control aims at increasing response at the zero point by simultaneously energizing both solenoids.

Adjustment Procedure

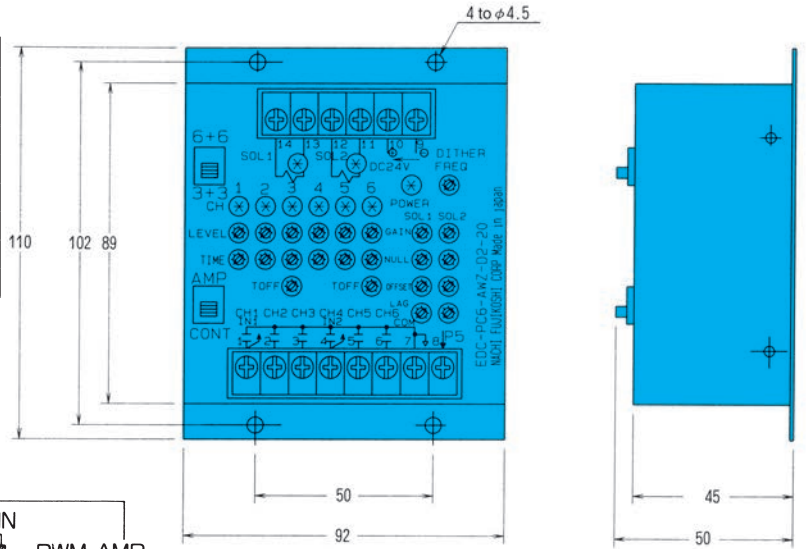
- 1) NULL, GAIN, OFFSET, LAG
 - Rotate all seven knobs counterclockwise as far as they will go.
- 2) Without any connection between terminals ① and ②, use the OFFSET knob to simultaneously energize SOL a and SOL b as follows.
 - SOL a 300mA (200mA)
 - SOL b 300mA (200mA)
- 3) Next, apply +5V to terminal ① (connecting ① and ④), and set the SOL a GAIN knob to the following.
 - SOL a 850mA
 - SOL b 300mA
- 4) Apply -5V to terminal ① (connecting ① and ⑥), and set the SOL b GAIN knob for the following.
 - SOL a 0mA
 - SOL b 850mA

This completes the setting procedure.

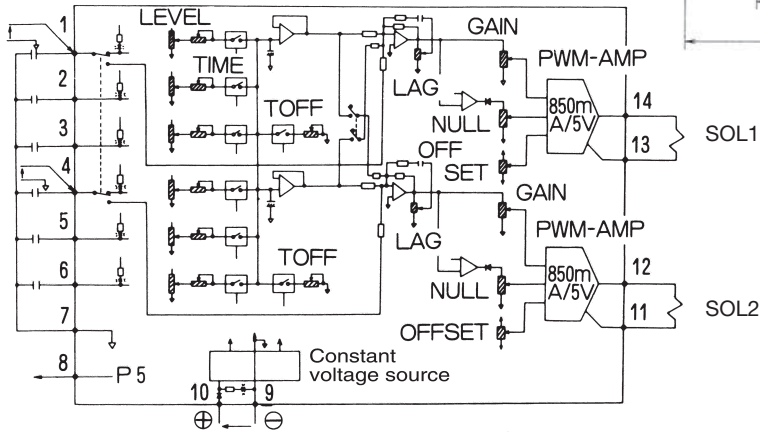
- The three LAG and NULL knobs should be left rotated fully counterclockwise. There is no need to change their settings.
- EDA-PD1-NWZ-D2-11 is configured with a feedback system, so it does not have a feedback gain adjustment function. In this case, use EDA-PD1-NWZ-D2-11 in combination with the EA-PD4-D10-*¹⁰ NACHI servo amp.

EDC-PC6-AWZ-D2-20

No.	Name	No.	Name
1	CH1 select terminal	7	COM
	Input signal terminal	8	External power supply P5
2	CH2 select terminal	9	- DC24V
3	CH3 select terminal	10	+ DC24V
4	CH4 select terminal	11	Output terminal to valve SOL 2
	Input signal terminal	12	
5	CH5 select terminal	13	Output terminal to valve SOL 1
6	CH6 select terminal	14	



Block Diagram



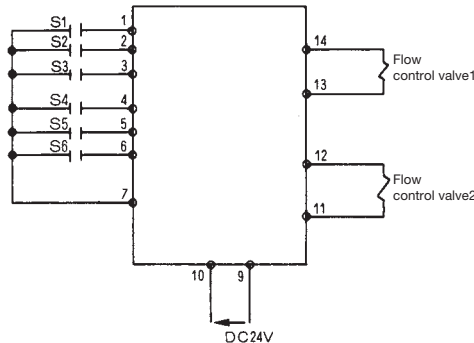
24V DC (24 to 30V, 2% max. ripple) <2A max. power supply>

- Dual simultaneous output to SOL 1 and SOL 2 is supported.
- To measure current, measure the voltage at SOL a terminal 13 and SOL b terminal 14, using terminal 7 as reference. The voltage across the 0.5Ω current detection resistor at 1A is 0.5V. Use a measurement device with an input impedance of at least 1MΩ.

Application Examples

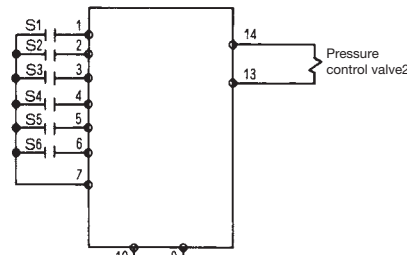
1) Switch Position

- CONT
- 3+3



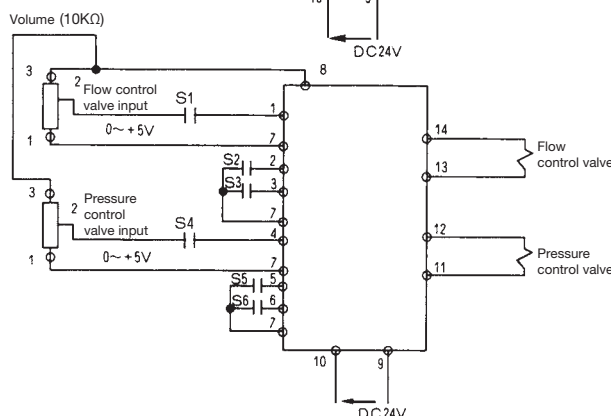
2) Switch Position

- CONT
- 6+6

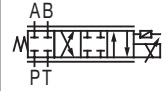
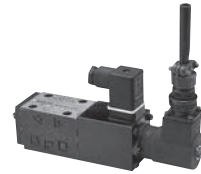


3) Switch Position

- AMP
- 3+3



- Simultaneous control using two flow control valves (3-speed)
As shown in the diagram to the left, flow control 1 speed is controlled with CH1 LEVEL when CH1 and CH2 are turned on at the same time. Next, flow control valve 2 speed is controlled by CH4 LEVEL, and simultaneous control is possible by adjusting flow control valve 1 speed in the same way. 3-speed synchronous control is possible by grouping CH1 through CH3 and CH4 through CH6.
- Pressure control valve 6-pressure control
As shown in the diagram to the left, this amplifier can be use as a 6-channel controller for a single pressure control valve. Minimum pressure at this time is in accordance with the setting of the OFFSET knob. The NULL knob cannot be used to configure settings unless a channel is selected.
- 2-output amplifier for simultaneous control of load-sensitive system pressure and flow rate
As shown in the diagram to the left, 0 to +5V input and channel CH2 or CH3 input are added together and output to the flow control valve. Likewise, 0 to +5V and CH5 or CH6 input is added together and output to the pressure control valve.



High-response proportional flow control valve

10 to 50ℓ/min
32MPa

Features

- Frequency response equivalent to an electro-hydraulic servo valve.
- Direct spool by a high-output proportional solenoid.
- Differential transformer for accurate spool positioning with minor feedback.
- Recovery of all port block positions following amp power off or wiring disconnection (Failsafe Function).
- Steel spool and spring for long life.

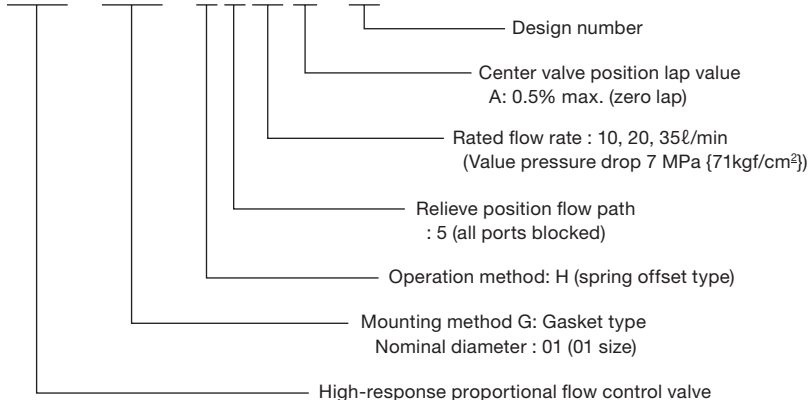
Specifications

Item	Model No.	ESH-G01-H510A-10	ESH-G01-H520A-10	ESH-G01-H540A-10
Maximum Operating Pressure P, A, B MPa(kgf/cm ²)		32 {327}		
T Port Allowable Back Pressure MPa(kgf/cm ²)		2.5 {25.5} max.		
Rated Flow Rate ℓ/min (Valve pressure drop 7MPa{71kgf/cm ² })		10	20	35
Maximum Flow Rate ℓ/min		22	35	50
Limit Valve Pressure Drop MPa(kgf/cm ²)		32 {327}	21 {214}	14 {143}
Hysteresis %		0.5 max.		
Step Response ms (0→100% Displacement)		16 max. (Note 1)		
Frequency Response Hz (90° Phase Delay ±10% Displacement)		At least 80 (Note 1)		
Center Drift	Supply Pressure	0.5% max/FS (Δp=25MPa{255kgf/cm ² })		
	Oil Temperature	1.5% max/FS (Δt=40°C)		
Filtration		Class NAS9 max.		
Operating Oil Temperature Range °C (Recommended Oil Temperature Range °C)		0 to 60 (30 to 60)		
Water and Dust Resistance		IP53		
Weight kg		2.3		

Note) 1. Step response is typical value for a supply pressure of 7MPa {71kgf/cm²} and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

Explanation of model No.

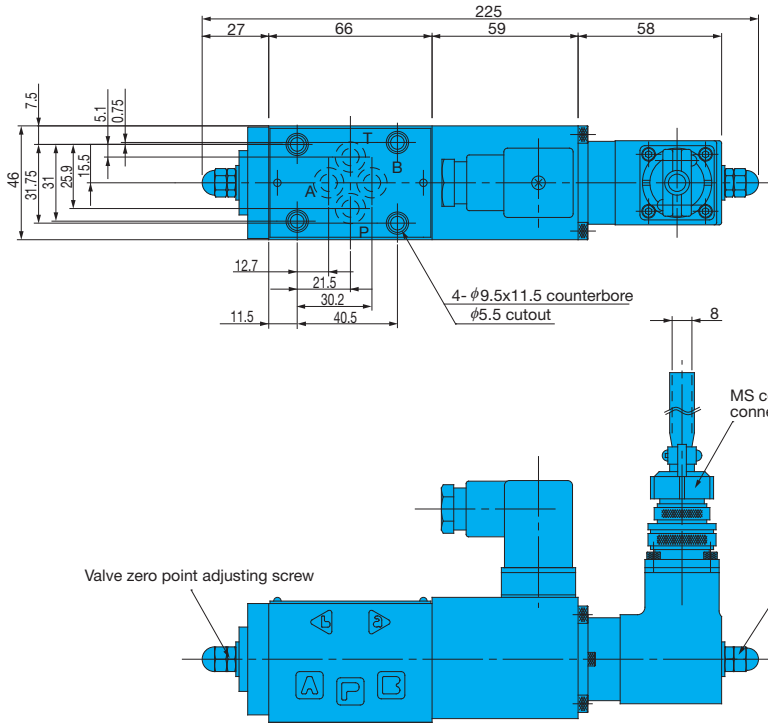
ESH - G 01 - H 5 20 A - 10



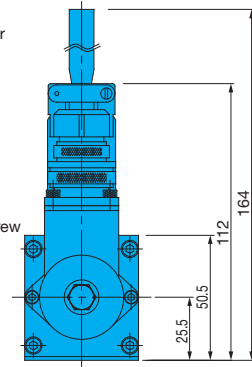
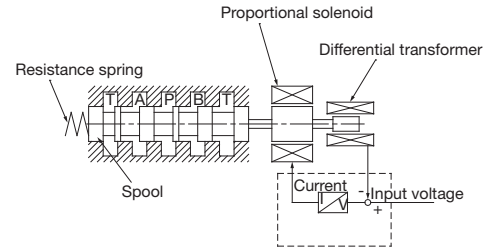
● Handling

- 1 The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.
- 2 The differential transformer zero adjust screw and valve zero adjust screw are adjusted and fixed at the factory. Because of this, you should not touch the screws (sealed cap nuts).
- 3 Install the valve so the spool axis line is horizontal.
- 4 In the case of 3-port applications and for the direction that throughflow is most common, use of the following flow is recommended P→A→B→T. P→A limit differential pressure is greater than that of P→B.
- 5 Be sure to perform sufficient flushing before a test run.
- 6 Use steel piping for this valve and the main actuator, and keep piping as short as possible.
- 7 There is no air bleeding.
- 8 Mineral oil hydraulic operating fluid is standard. Use an R&O type and wear-resistant type of ISO VG32, 46, or 68 or equivalent.
- 9 Use an operating fluid that conforms to the both of the following.
Kinematic viscosity : 20 to 140mm²/s
Oil temperature : 30 to 60°C
- 10 Filtration
Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.
- 11 Electrical wiring between the amp and valve should be no longer than 30 meters. For the solenoid valve use VCTF 2 mm² 2-conductor shielded wire, and for the differential transformer use VCTF 0.5 mm² 4-conductor shielded wire.
- 12 After disassembling the valve, be sure to fill the inside of the guide with operating fluid before reassembling.
- 13 Bundled Accessories (Valve Mounting Bolts)
M5 x 45ℓ, (four)
Tightening Torque :
5 to 7N·m{51 to 71kgf·cm}

Installation Dimension Drawings

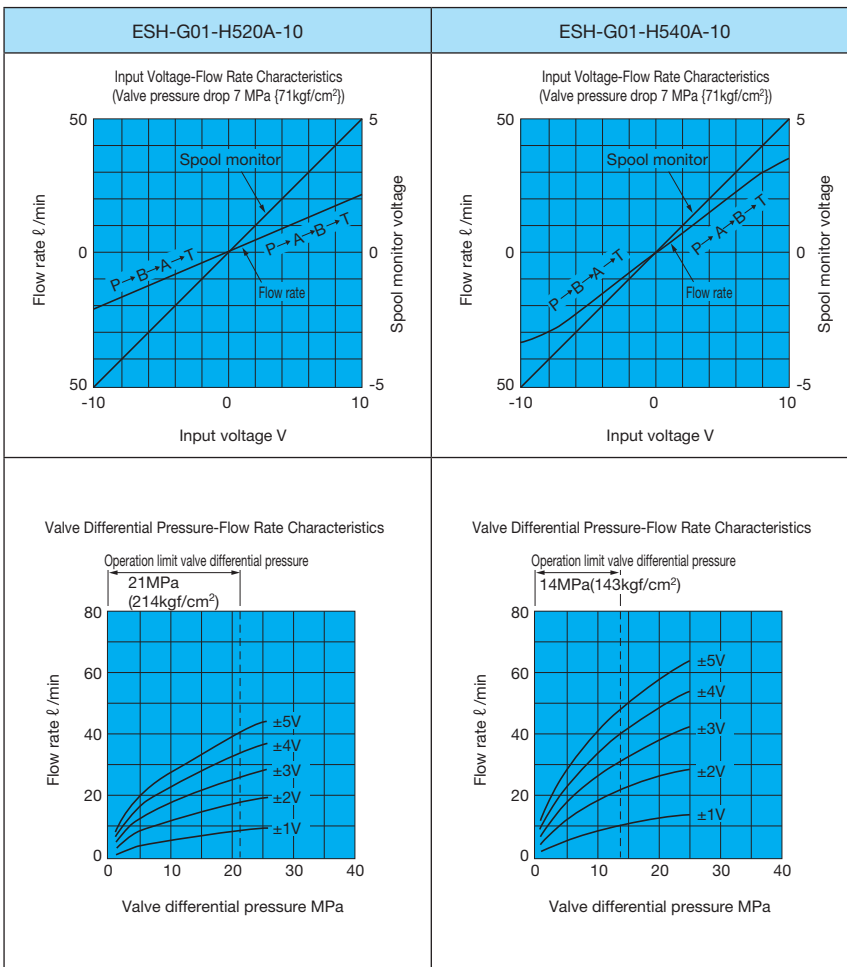


Operational Principle



The gasket mounting method conforms to ISO4401-03-02-0-05.

Performance Curves



Note) ±10V input amp factory default data.

Rotating the GAIN trimmer clockwise (rightward) increases the flow rate by up to 10%.

● Valve Pressure Drop and Rated Flow Rate

$$\text{Valve Pressure Drop } (\Delta P_x) = P_s - P_L - P_T$$

P_s : Valve supply pressure

P_L : Load pressure

P_T : T Port back pressure

The rated flow rate is the value when the above valve pressure drop is 7MPa {71kgf/cm²}.

● Valve Pressure Drop and Control Flow Rate

The following is the maximum control flow rate when the size of the obtained valve pressure drop is

$$Q_x = Q_{rate} \times \sqrt{\frac{\Delta P_x}{7}}$$

Q_{rate} : Rated flow rate

$$\Delta P_x = P_s - P_L - P_T$$

● Calculation example

When ESH-G01-H520A-10 is used under the following conditions:

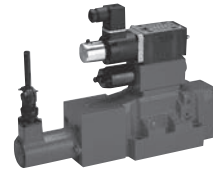
$P_s = 10\text{MPa}\{102\text{kgf/cm}^2\}$

$P_L = 6\text{MPa}\{61\text{kgf/cm}^2\}$

$P_T = 1\text{MPa}\{10\text{kgf/cm}^2\}$

Maximum control flow rate Q_x is as shown below:

$$Q_x = Q_{rate} \times \sqrt{\frac{P_s - P_L - P_T}{7}} = 20 \times \sqrt{\frac{10 - 6 - 1}{7}} = 13\text{l/min}$$



High-response proportional flow control valve ESH-G03,04,06 80 to 600ℓ/min 28,32MPa

Features

- Main spool minor feedback for greatly increased hysteresis and repeatability.
- Response characteristics suitable to 20Hz and high precision acceleration control.
- Recovery of center position following amp power off or wiring disconnection (Failsafe Function).
- Single rod cylinder spool available for easy use.
- Built-in pilot pressure reducing valve for stable operation.

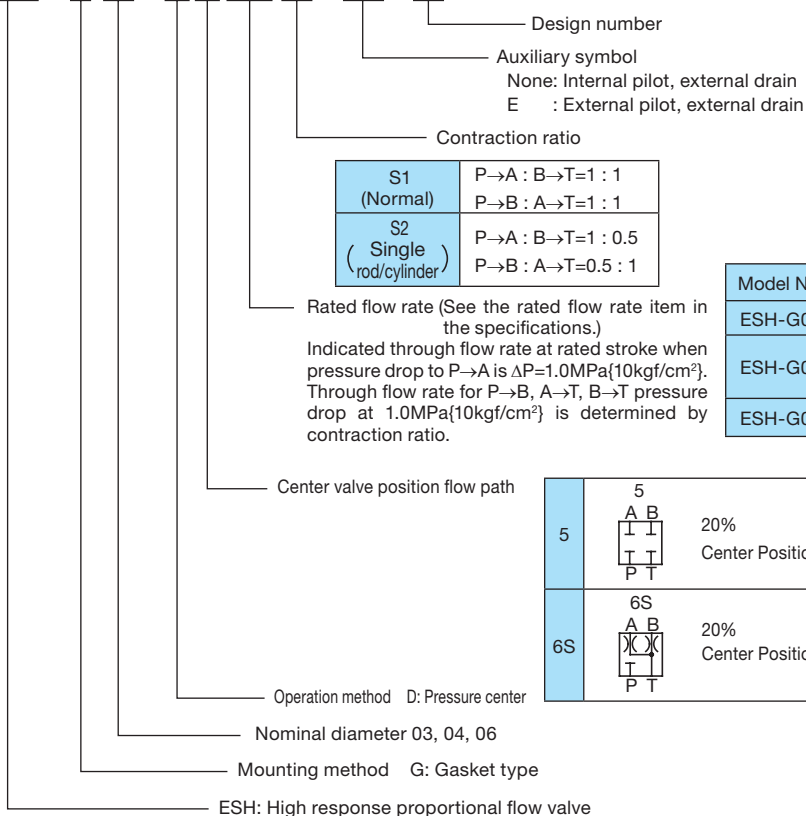
Specifications

Item	Model No.		ESH-G03-D*****-(*)-11	ESH-G04-D*****-(*)-11	ESH-G06-D*****-(*)-11	
	Maximum Operating Pressure MPa{kgf/cm ² }	P,A,B Ports	External Pilot	28 {286}	32 {327}	32 {327}
T Port		Internal Pilot	25 {255}	25 {255}	25 {255}	
				21 {214}	21 {214}	21 {214}
		Pp Port		25 {255}	25 {255}	25 {255}
Minimum Pilot Pressure MPa{kgf/cm ² }			1.5 {15}	1.5 {15}	2.0 {20}	
Rated Flow Rate ℓ/min (Rated stroke, P→A pressure drop of 1MPa {10kgf/cm ² } flow rate)			80	180	350	
Maximum Flow Rate ℓ/min			140	300	600	
Pilot Pressure Reducing Valve Set Pressure MPa{kgf/cm ² }			2.0 {20}	2.0 {20}	4.0 {40}	
Hysteresis %			0.5 max.	0.5 max.	0.5 max.	
Step Response ms (0→100% displacement)			50 (Note1)	50 (Note1)	50 (Note1)	
Frequency Response Hz (±10% input, 90° phase delay)			20 (Note1)	20 (Note1)	20 (Note1)	
Pilot Flow Rate ℓ/min			4	8	12	
Y (DR1), L (DR2) allowable back pressure MPa{kgf/cm ² }			0.2 {2}	0.2 {2}	0.2 {2}	
Weight kg			8	12	18	

Note) 1. Step response is typical value for a supply pressure of 7MPa {71kgf/cm²} and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

Explanation of model No.

ESH - G 04 - D 5 180 S1 - (*) - 11



● Handling

1 Air Bleeding

In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation.

2 Y (DR1), L (DR2) Ports

Connect ports Y (DR1) and L (DR2) directly to the fluid tank so they are always supplied with operating fluid, in order to keep back pressure no greater than 0.2MPa {2kgf/cm²}.

3 L (DR2) Port

Since this valve is a pressure center type, G04 and G06 have an L (DR2) port. Be sure to connect this port directly to the fluid tank.

G03 has a Y (DR1) port only, and this is connected internally to L.

4 Valve Mounting Orientation

Install the valve so the spool axis line is horizontal.

5 Filtration

Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.

6 The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.

7 Oil-based operating fluid is standard. Use an R&O type and wear-resistant type of ISO VG32, 46, or 68 or equivalent.

8 Use an operating fluid that conforms to the both of the following.

Kinematic viscosity: 20 to 140mm²/s
Oil temperature: 30 to 60°C

9 Electrical wiring between the amp and valve should be no longer than 30 meters. For the solenoid valve use VCTF 2 mm² 2-conductor shielded wire, and for the differential transformer use VCTF 0.5 mm² 4-conductor shielded wire.

10 Bundled Accessories (Valve Mounting Bolts)

11 With G03 and G04, providing command in the range of 0 to +10V to the amp's RF input produces a flow of P→A→B→T. With G06, flow is P→B→A→T.

Model No.	Bolt Size	Q'ty	Tightening Torque N-m {kgf-cm}
ESH-G03	M 6×35ℓ	4	10 to 13 {102 to 133}
ESH-G04	M10×50ℓ	4	45 to 55 {460 to 561}
	M 6×45ℓ	2	10 to 13 {102 to 133}
ESH-G06	M12×60ℓ	6	60 to 70 {610 to 715}

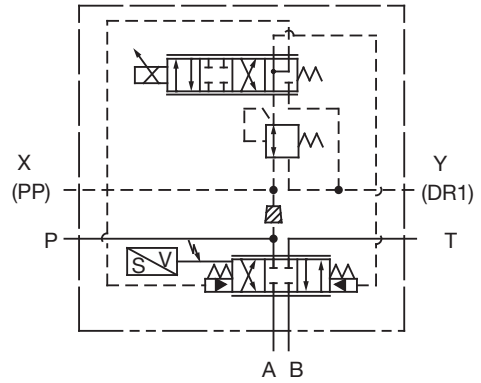
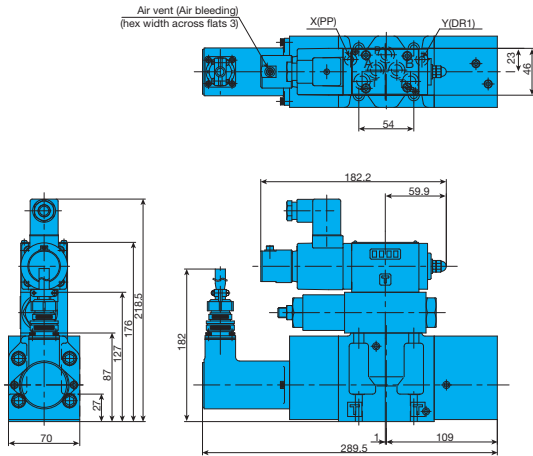
12 For G03 and G04, connect the ports and actuator to achieve a working of P→A→B→T. For G06, connect for a working of P→B→A→T.

13 Contact your agent for a contraction ratio S2 with the G06 size.

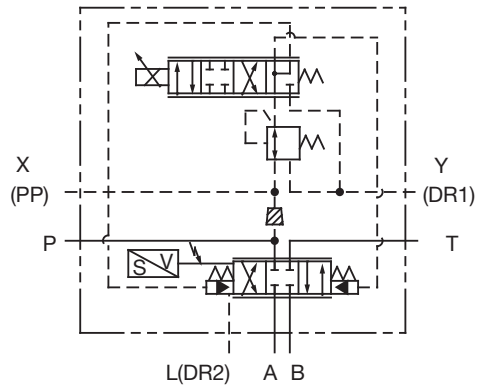
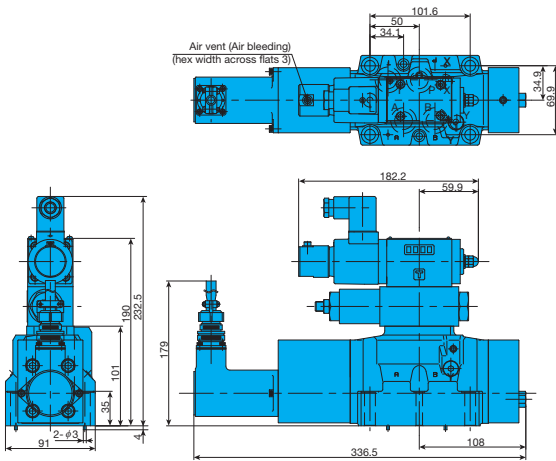
Installation Dimension Drawings

JIS Symbol

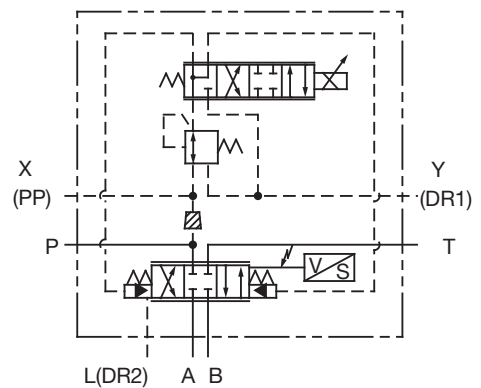
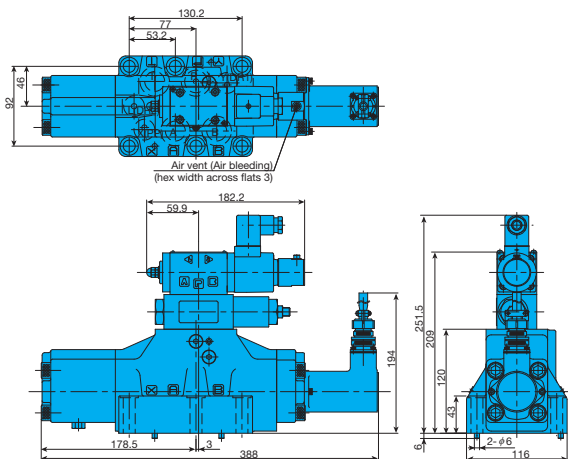
ESH-G03



ESH-G04



ESH-G06



Note: A stopper plug is needed for the area if the pilot is external.

Gasket Surface Dimensions

For G03, see ESD-G03 gasket surface dimensions, and for G04 and G06, see Dss-G04, 06-**-20 gasket surface dimensions. Y (DR1) and L (DR2) are required.

Gasket surface dimensions conform to the following.

- G03 : ISO 4401-05-04-0-05
- G04 : ISO 4401-07-07-0-05
- G06 : ISO 4401-08-08-0-05



High-speed Response Proportional Control Valve Amplifier EHA Series

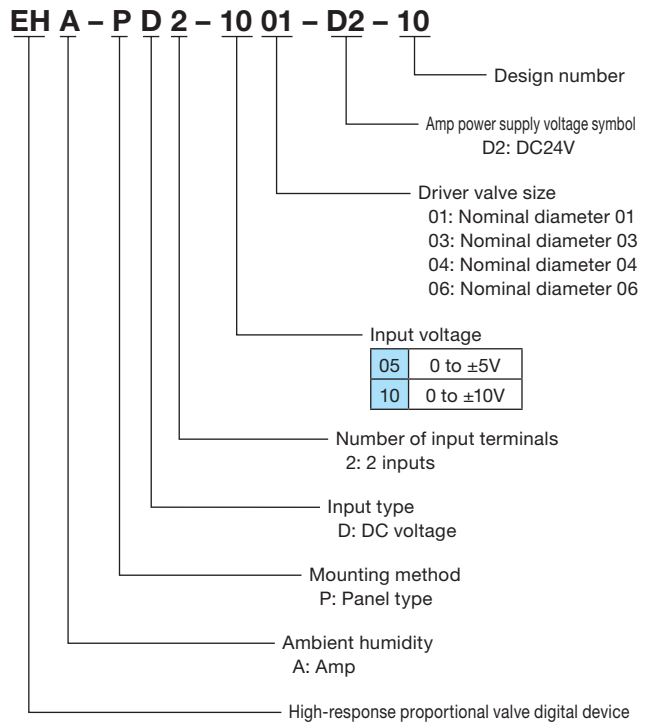
Features

- Coil current feedback and spool position feedback amplification for stable, high-speed spool positioning.
- Built in check connector ICS simplifies maintenance.
- A single printed circuit board allows separation of connectors and the terminal box.
- Built-in differential transformer disconnect detection circuit drops coil current to 0mA when disconnection occurs.
- Servo ready and servo ON interfaces.
- Power supply and current control switching system for improved efficiency.

Specifications

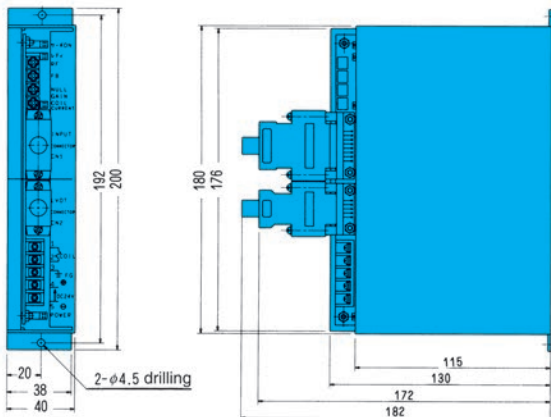
Power Supply Voltage	24V DC (22V DC to 28V DC) Lip Noise: 150mVp-p max.
Power Supply Capacity	At least 2.1A (COSEL R50A-24 equivalent switching regulator)
Ambient Temperature	0 to 50°C
Ambient humidity	35 to 85% RH (non-condensation)
Input Signal Voltage	0 to ±5V DC or 0 to ±10V DC
Input Impedance	50kΩ
Power Consumption	2.1A maximum consumption current at 24V
Weight	0.9kg
External Supply Voltage	+5V : (10mA maximum supply possible) -5V : (10mA maximum supply possible)
Drive Coil	2.5Ω; max. 2.7A or 5Ω; max. 2.4A
Spool Displacement Measurement	Differential transformer (LVDT)
Servo ON	Application of 24V DC during valve operation
Ready	During normal valve operation: ON
Spool displacement monitor	0 to ±5V

Explanation of model No.

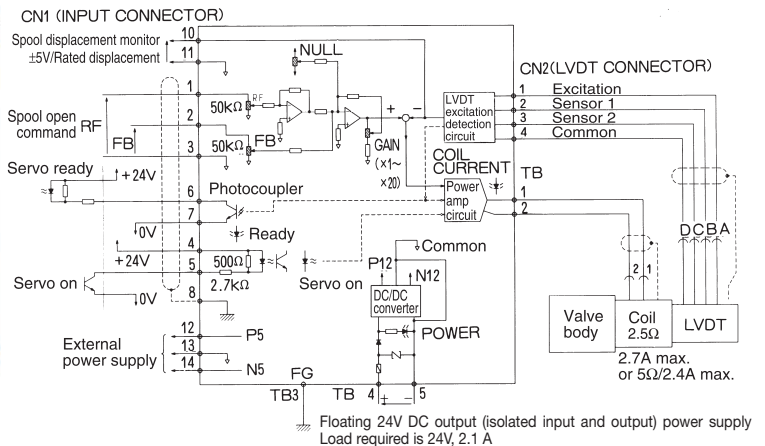


Note) Select an amp that matches the valve size.

Installation Dimension Drawings



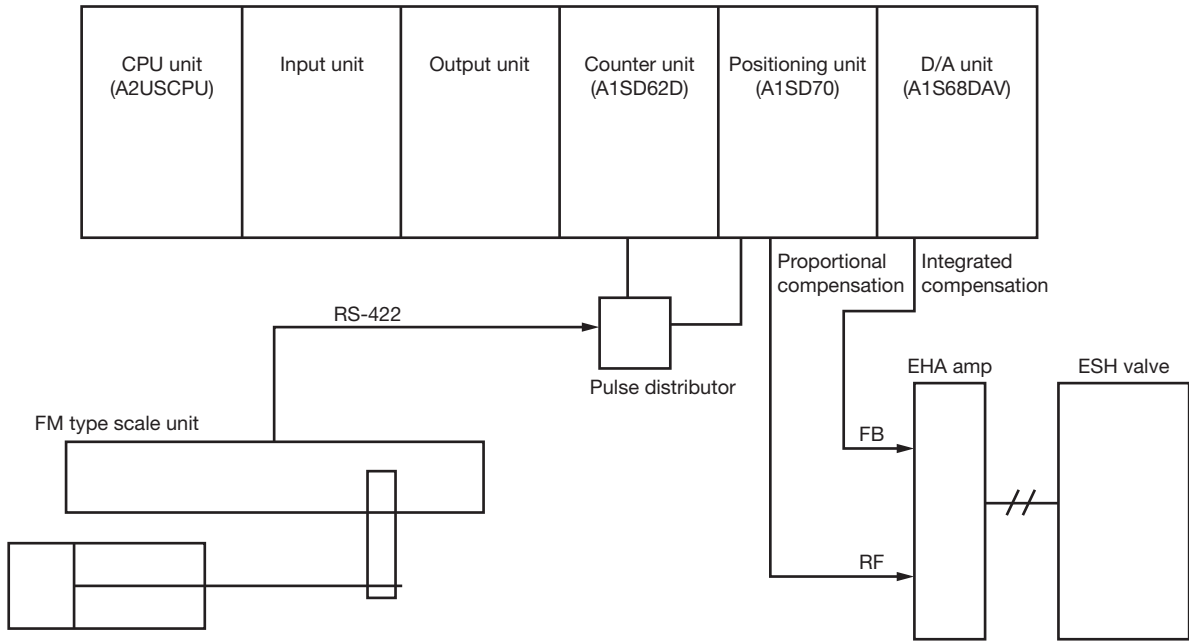
Block Diagram



Note) Since G03, G04, and G06 are pilot operation types, there is an LVDT on the main spool, but connection is identical.

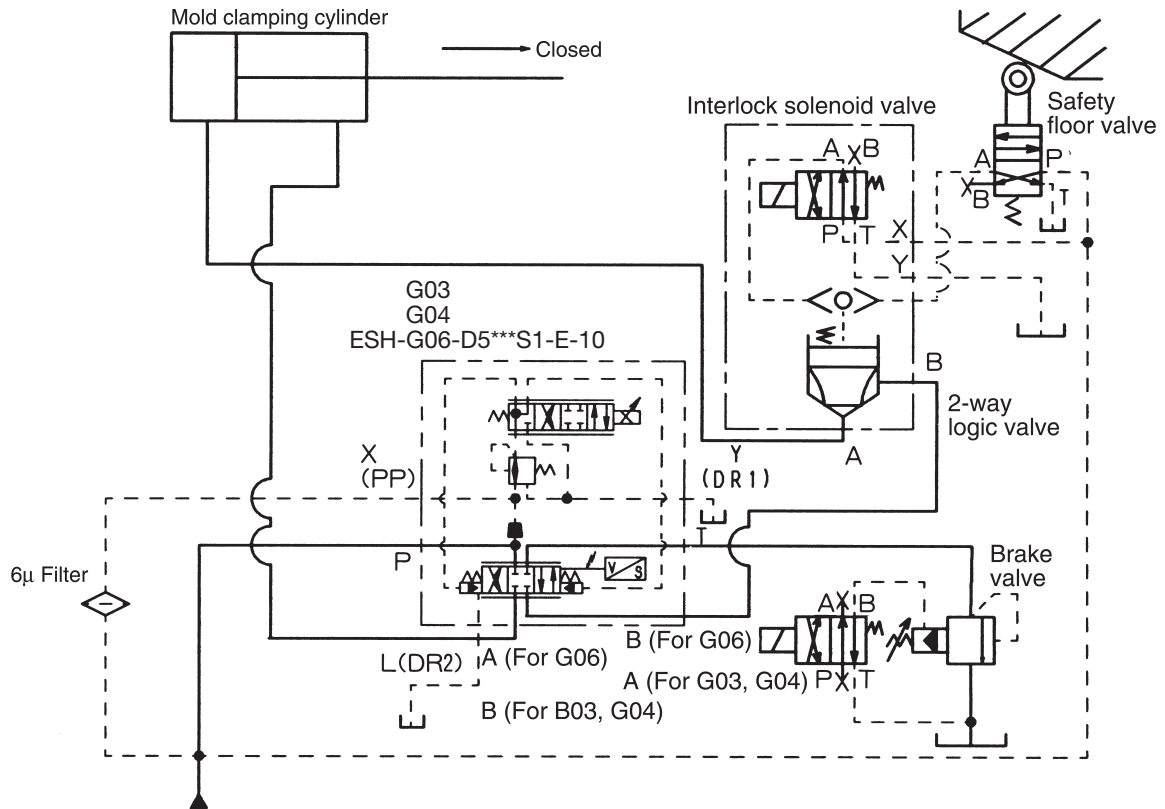
(1) Example Application in ESH-G01 Positioning Circuit

This is an ESH-G01 positioning circuit using a sequencer. Proportional control is performed by the positioning unit, while integral compensation is performed by the counter unit and D/A unit. The result is high-precision positioning.



(2) Example Application in ESH-G03, G04, G06 Molding Machine Mold Clamping Circuit

This hydraulic circuit is a basic application example. The actual application hydraulic circuit would require modification to match the machinery and to provide the necessary functions. Cut off flow to the cylinder with the safety door valve and interlock solenoid valve, in accordance with the logic valve.



Electro-hydraulic Servo Valve Driver Servo Amplifier

Features

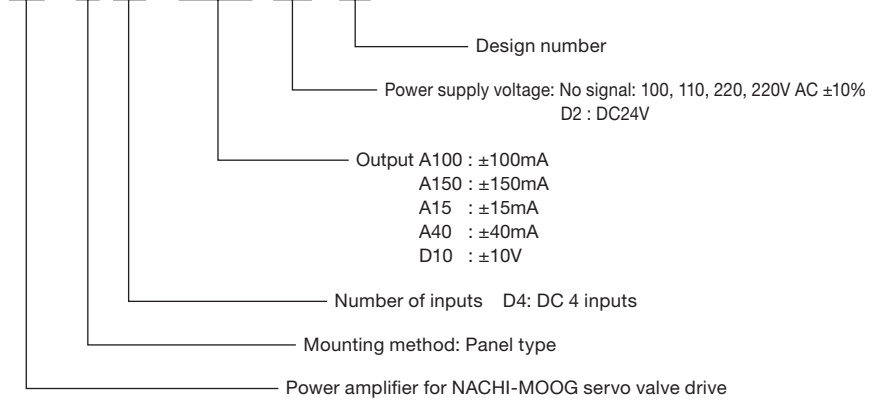
- ① Compact design.
- ② Capable of driving virtually all NACHI-MOOG servo valve series.
- ③ Power supply support for 24V DC in addition to 100V AC and 200V AC.

Specifications

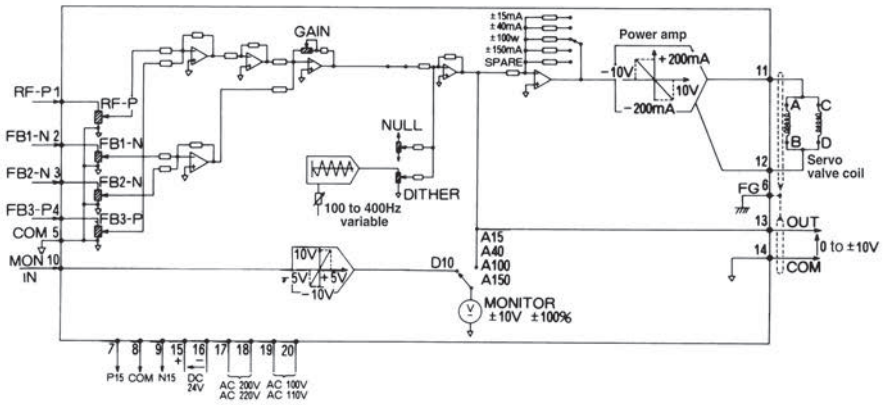
Item	Description
Number of Inputs	4 (RF-P,FB1-N,FB2-N,FB3-P)
Input Voltage Range	±10VDC (Command Signal/ Feedback Signal)
Input Impedance	50kΩ
Gain Adjust (GAIN)	1 to 20 X/5 to 100 X switchable
Zero Adjust (NULL)	0 to ±20%
Frequency Characteristics	-3dB attenuation at 700Hz
Dither	100 to 400Hz variable (Factory default; 200Hz)
Power Supply Voltage	AC100, 110, 200, 220V (±10%) 50/60Hz
Power Consumption	20VA
External power supply	+15V (200mA) -15V (200mA)
Allowable Ambient Temperature	0 to 50°C
Temperature Drift	50μV/°C max.
Weight	3kg
Servo Valve Coil Drive Current	± 15mA(100Ω) ± 40mA(40Ω) ±100mA(14Ω) ±150mA(14Ω) It is possible to switch the output voltage ±10V for the four types noted above. Resistance values in parentheses indicate resistance in the case of parallel wiring of the servo valve coil.

Explanation of model No.

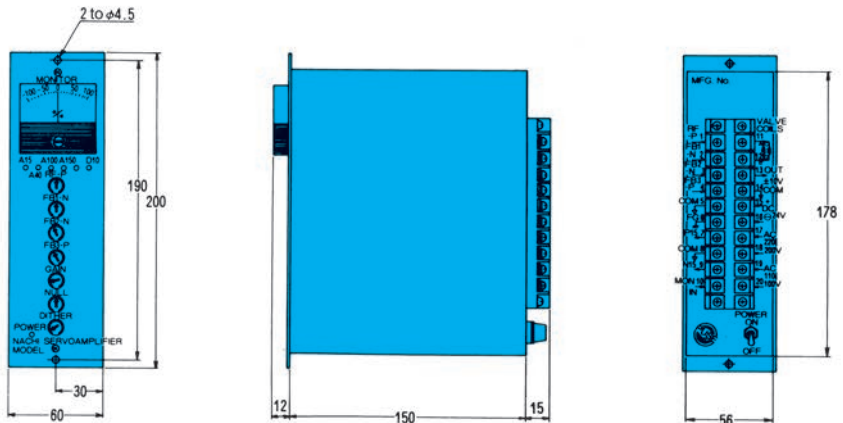
EA - P D4 - A100 - ** - 10



Note: 24V DC only can be used in the case of power supply voltage signal D2. 100V, 200V AC cannot be used.



No.	Name	No.	Name
1	RF-P input	11	Control current
2	FB1-N- feedback input	12	Output terminal
3	FB2-N- feedback input	13	Control voltage
4	FB3-P- feedback input	14	Output terminal
5	COM signal land	15	+ DC24V
6	FG case ground	16	- DC24V
7	P15 external power supply	17	AC200, 220V
8	COM signal land	18	AC200, 220V
9	N15 external power supply	19	AC100, 110V
10	MON/IN monitor in	20	AC100, 110V

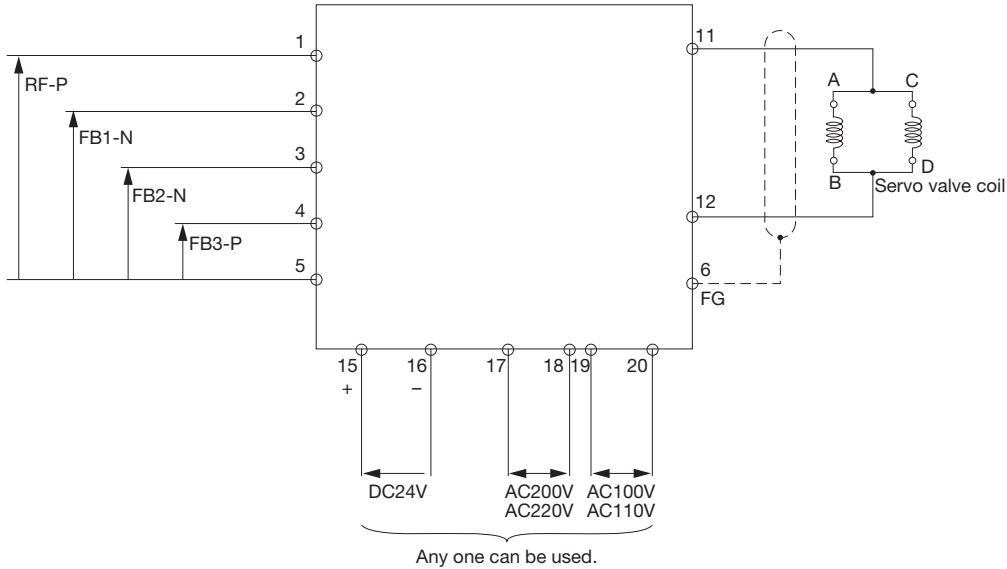


Servo Valve and Applicable Servo Amplifier Models

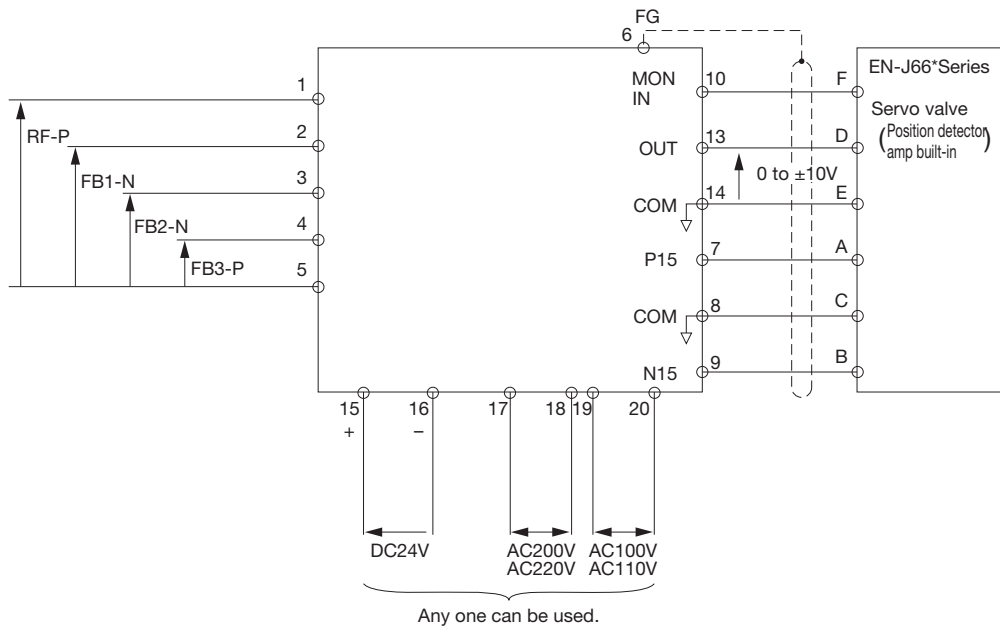
Servo Model Number	Rated Output	Applicable Servo Amplifier Model Number
EN-J631 Series	±100mA (parallel wiring)	EA-PD4-A100
EN-J631 Series Center Flow 75 l/min Rated Models	±150mA (parallel wiring)	EA-PD4-A150
EN-J072-401, EN-J072-402, EN-J073-401, EN-J073-402, EN-J073-403, EN-J073-404, EN-J073-405, EN-J076-401, EN-J076-402, EN-J076-403, EN-J076-404, EN-J076-405	±15mA (parallel wiring)	EA-PD4-A15
EN-J072-403, EN-J770, EN-J073-406, EN-J076-406	±40mA (parallel wiring)	EA-PD4-A40
EN-J661 EN-J662 (Main Valve Position Detector or AmP Built In) EN-J663	±10V	EA-PD4-D10

Wiring Diagram

EN-J631, J072, J073, J076, J770 Series



EN-J661, J662, J663 Series



Composite Valve Series Logic Valve

200 to 2300ℓ/min
28,32MPa



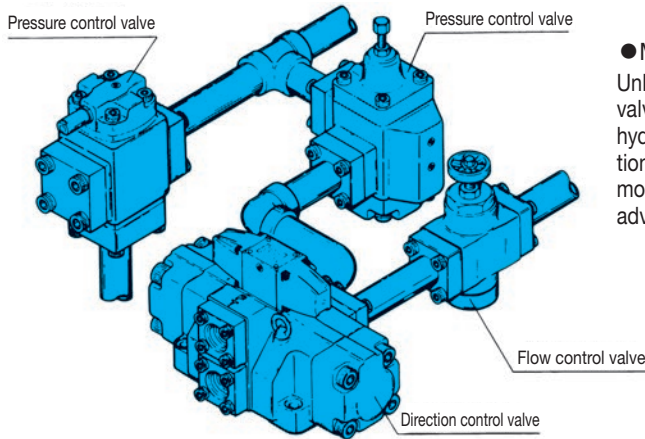
Overview

HYDRO-LOGIC composite valves revolutionize the structure of hydraulic control valves in a way that makes it possible to control multiple functions with a single valve. Unlike contemporary valves that limit each valve to a single function, the HYDROLOG-

IC control valve allows a tremendous reduction in overall equipment size and energy savings as well. In addition, a poppet structure delivers high response, low leakage, and outstanding power.

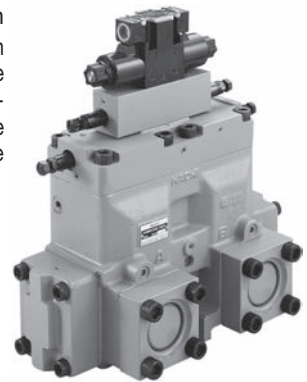
These valves are made possible by

fully applying technology of the proven cartridge logic valve. A gasket type and flange type logic valve series can be used with total confidence in a wide variety of hydraulic applications. (For details, see catalog number 9244-2.)



- **Multi-function in a compact design**
Unlike single-valve systems where each valve performs a particular function, the hydro-logic valve provides multiple functions in a very compact configuration. The more complex a circuit is, the greater the advantages of using this type of valve.

Hydro-logic valve



Features

① **Multi-function composite valve to meet high-level hydraulic needs**

A single multi-function composite valve controls direction, pressure and flow.

② **Makes hydraulic equipment more compact**

Since a single valve performs multiple functions, the number of required valves is reduced, which simplifies the hydraulic circuit and makes the overall design of the equipment more compact.

③ **Fast switching with less shock**

A poppet valve is used for the basic structure, which eliminates overrun and reduces mass for very fast switching. A restrictor valve built into the pilot line makes it possible

to freely set the open/close timing of each port and easily reduce shock.

④ **Less internal leaking than spool type valves**

Poppet seal construction minimizes seat leaks, while a long slide length ensures much less internal leaking than a spool type valve.

⑤ **Dramatically reduced hydraulic equipment production cost**

A fewer valves not only means more compact designs, it also translates into much lower production costs.

⑥ **Dimensions conform to international ISO standards**

The 06, 10 sizes gasket type valve mounting dimensions conform

to ISO standards for easy interchangeability with existing valves (except for 3-direction valves).

⑦ **Simple mounting, without modification**

Unlike cartridge type valves that require drilling of holes in the block, gasket installation and flange connection of this type of valve is quick and simple.

⑧ **A wide selection of valve models**

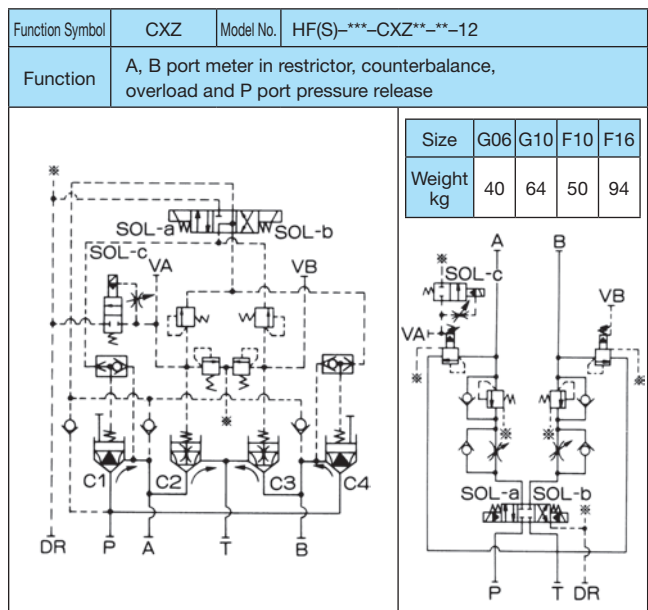
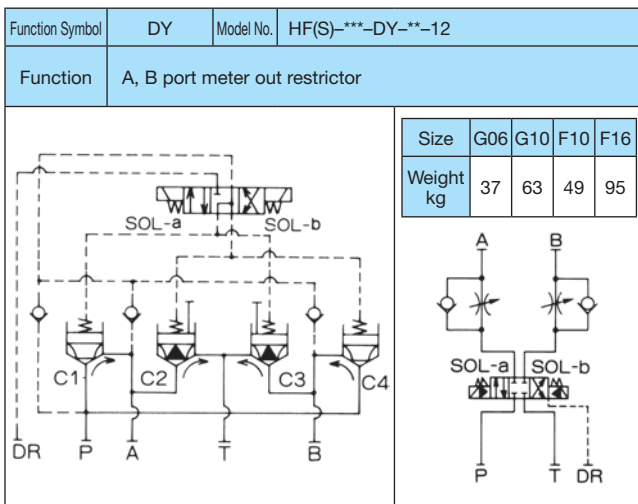
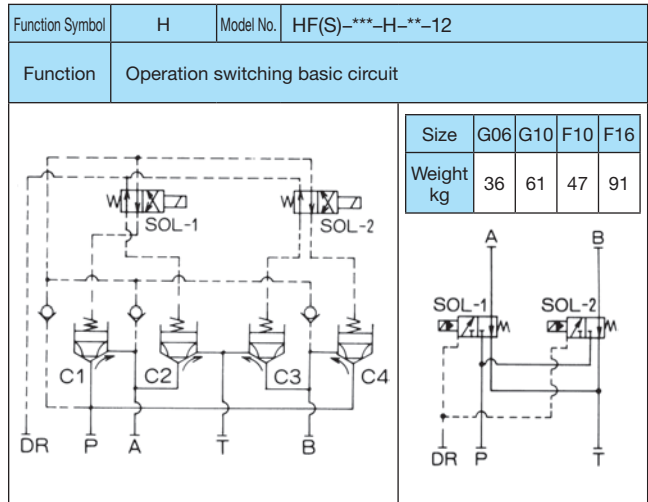
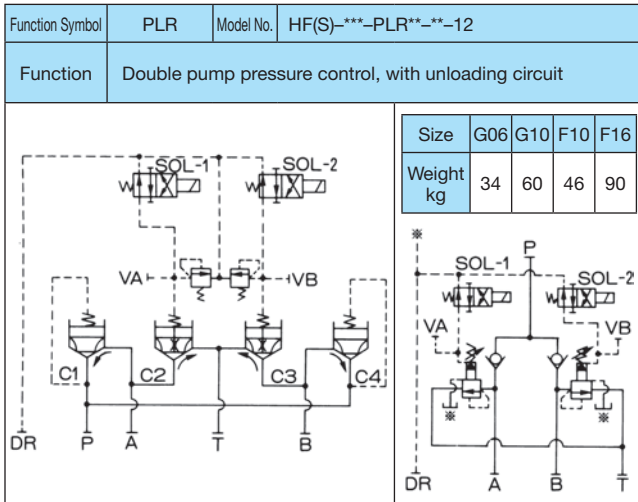
An extensive selection of models includes Size 13 2-direction valves and size 2000 3-direction and 4-direction valves to meet a wide range of needs.

Main Specifications

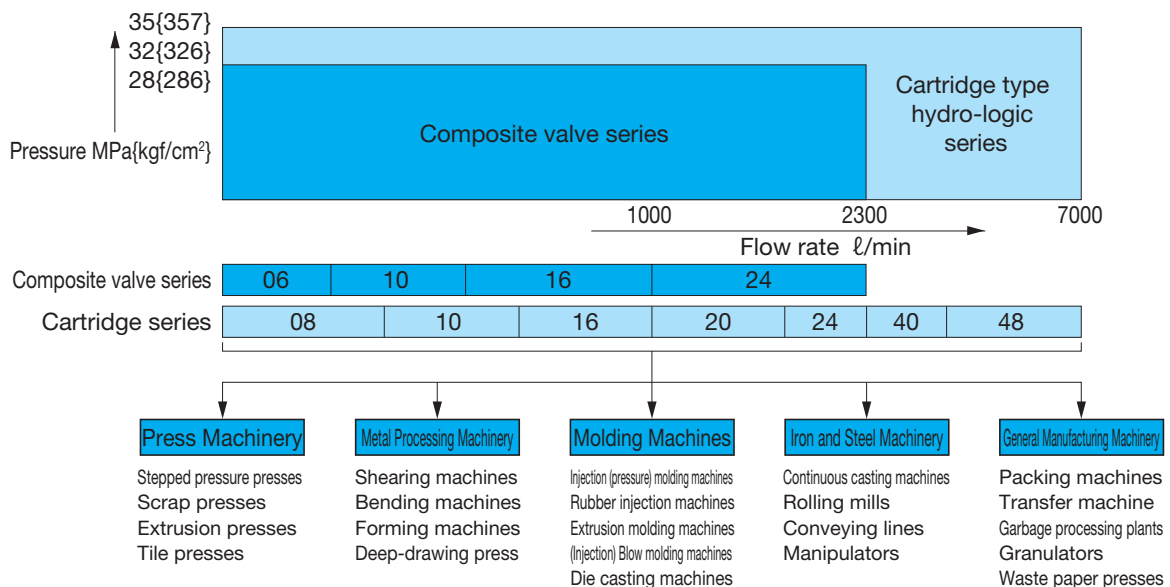
2-Direction Valves	3-Direction Valves	4-Direction Valves		Pipe Diameter (Nominal Diameter)	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Flow Rate ℓ/min
		Gasket Mounting	Flange Mounting			
HT(S)-G06	HY(S)-G06	HF(S)-G06	—	3/4B	28{286} (32{326})Note 2	200(*120)
HT(S)-G10	HY(S)-G10	HF(S)-G10	HF(S)-F10	1 1/4B		500(*300)
HT(S)-G16	—	—	HF(S)-F16	2B		1000(*600)
—	—	—	HF(S)-F24	3B(4B)	32{326}	2300

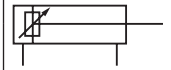
Note) 1. Flow rates marked with an asterisk (*) apply to 2-direction model number 2G* (pressure reducing valve).
2. The maximum operating pressure for 3-direction valves is 32MPa {326kgf/cm²}.
Contact your agent for details.

Main Circuit Symbol Examples



Applications





FJ Series General Purpose Hydraulic Cylinder

φ30 to 250×1000ST
7, 14MPa

Features

- ① General purpose FJ series hydraulic cylinders have a high level of compatibility and interchangeability, plus very stable performance and quality.
- ② All component parts are completely standardized for quick delivery and easy parts replacement, maintenance, and inspection.
- ③ Specially selected materials used in tubes, rods, packing, bolts and all other parts ensures durability. In a tough environment.

Specifications

Item	7MPa{71.4kgf/cm ² }Series	14MPa{143kgf/cm ² }Series	Remarks
Maximum Working Pressure	7MPa{71.4kgf/cm ² }	14MPa{143kgf/cm ² }	When using a meter out inhibitor, take care that pressure generated in the rod side cylinder chamber does not exceed the limits shown to the left.
Withstand Pressure	10.5MPa{107kgf/cm ² }	21MPa{214kgf/cm ² }	
Minimum Operating Pressure	0.3MPa{3.06kgf/cm ² }	0.3MPa{3.06kgf/cm ² }	
Load Pressure Coefficient	At least 95%		
Allowable Maximum Speed	18m/min		
Allowable Minimum Speed	0.3m/min		
Cylinder Inside Diameter (mm)	30, 40, 50, 63, 80, 100, 125, 140 150, 160, 180, 200, 224, 250		See page K-2 for strokes greater than 1000mm.
Stroke	Standard up to 1000mm.		
Rod Diameter	Rod B and Rod C		Fire resistant hydraulic fluid is also handled as standard products. Contact your agent for more information.
Operating Fluid and Oil Temperature	Operating Fluid : Oil-based operating fluid Oil Temperature : -10°C to 80°C		
Paint Color	Mancel No. 5B 6/3 Melamin No. 51		
			Or red rust-resistant paint

Note) Contact your agent for non-standard requirements.
The following series are also available.
FH Series (21MPa)
FL Series (3.5MPa)
FLS Series (with switch)

Cylinder Specifications (Major Characteristics Calculated Values)

		Cylinder Inside Diameter mm															
Major Characteristics		30	40	50	63	80	100	125	140	150	160	180	200	224	250		
Port Diameter Rc (Previously PT)		3/8	3/8	1/2	1/2	3/4	3/4	1	1	1	1	1 1/4	1 1/2	1 1/2	2		
Head Side Area (cm ²)		7	12.5	19.6	31.1	50.2	78.5	122.7	153.9	176.7	201	254.4	314.1	394	490.8		
Rod Diameter Rod B	Rod Diameter (mm)	18	22.4	28	35.5	45	56	71	80	85	90	100	112	125	140		
	Rod Side Area (cm ²)	4.5	8.6	13.5	21.3	34.3	53.9	83.2	103.7	120	137.4	175.9	215.6	271.3	336.9		
	Rod Area (cm ²)	2.5	3.9	6.1	9.8	15.9	24.6	39.5	50.2	56.7	63.6	78.5	98.5	122.7	153.9		
	Speed Ratio	Forward	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
		Reverse	1.55	1.45	1.45	1.46	1.46	1.45	1.47	1.48	1.47	1.46	1.44	1.45	1.45	1.45	
	Output kN {kgf}	7MPa {71.4kgf/cm ² }	Forward	4.90 {500}	8.75 {893}	13.72 {1400}	21.77 {2221}	35.14 {3584}	54.95 {5605}	85.89 {8761}	107.73 {10988}	123.69 {12616}	140.70 {14351}	178.08 {18164}	219.87 {22427}	275.80 {28132}	343.56 {35043}
			Reverse	3.15 {321}	6.02 {614}	9.45 {964}	14.91 {1521}	24.01 {2449}	37.73 {3848}	58.24 {5940}	72.59 {7404}	84.00 {8568}	96.18 {9810}	123.13 {12559}	150.92 {15394}	189.91 {19371}	235.83 {24055}
		14MPa {143kgf/cm ² }	Forward	9.80 {1001}	17.50 {1788}	27.44 {2803}	43.54 {4447}	70.28 {7179}	109.90 {11226}	171.78 {17546}	215.46 {22008}	247.38 {25268}	281.40 {28743}	356.16 {36379}	439.74 {44916}	551.60 {56342}	687.12 {70184}
			Reverse	6.30 {644}	12.04 {1230}	18.90 {1931}	29.82 {3046}	48.02 {4905}	75.46 {7708}	116.48 {11898}	145.18 {14829}	168.00 {17160}	192.36 {19648}	246.26 {25154}	301.84 {30831}	379.82 {38796}	471.66 {48177}
	Rod Diameter Rod C	Rod Diameter (mm)	—	18	22.4	28	35.5	45	56	63	67	—	—	—	—	—	
Rod Side Area (cm ²)		—	10	15.7	25	40.4	62.6	98.1	122.8	141.5	—	—	—	—	—		
Rod Area (cm ²)		—	2.5	3.9	6.1	9.8	15.9	24.6	31.1	35.2	—	—	—	—	—		
Speed Ratio		Forward	—	1	1	1	1	1	1	1	1	—	—	—	—	—	
		Reverse	—	1.25	1.24	1.24	1.24	1.25	1.25	1.25	1.24	—	—	—	—	—	
Output kN {kgf}		7MPa {71.4kgf/cm ² }	Forward	—	8.75 {893}	13.72 {1400}	21.77 {2221}	35.14 {3584}	54.95 {5605}	85.89 {8761}	107.73 {10988}	123.69 {12616}	—	—	—	—	
			Reverse	—	7.00 {714}	10.99 {1121}	17.50 {1785}	28.28 {2885}	43.82 {4470}	68.67 {7004}	85.96 {8768}	99.05 {10103}	—	—	—	—	—
		14MPa {143kgf/cm ² }	Forward	—	17.50 {1788}	27.44 {2803}	43.54 {4447}	70.28 {7179}	109.90 {11226}	171.78 {17546}	215.46 {22008}	247.38 {25268}	—	—	—	—	—
			Reverse	—	14.00 {1430}	21.98 {2245}	35.00 {3575}	56.56 {5777}	87.64 {8952}	137.34 {14028}	171.92 {17560}	198.10 {20235}	—	—	—	—	—
Cushion Stroke (mm)		—	20				25				30				35		

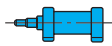
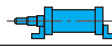
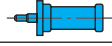
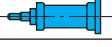
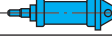


Note) 1.Non-cushion (N) is standard for inside diameter φ30. Contact your agent for information about cushions.
2.Speed ratio and out output specifications are theoretical values based on a rod diameter.

● Product not covered by ISO9001 registration

Explanation of model No.

FJ - FA N 1 J 100 B 1000 T R - 21

Cylinder name _____
 Mounting _____

LA Type	Axial right-angle foot Type	
* LB Type	Axial foot Type	
* FA Type FY Type	Rod side flange Type	
* FB Type FZ Type	Head side flange Type	
CA Type	Rear clevis Type	
TA Type	Rod side trunnion Type	
TC Type	Intermediate trunnion Type	

* LB, FA, and FB types are for 7MPa {71.4kgf/cm²} high operating pressure types. For flange types under higher pressures, use FY or FZ.

Cushioning _____

N	None
H	Head side cushioning
R	Rod side cushioning
B	Both side cushioning

Pressure classification _____

1	Maximum operating pressure: 7MPa{71.4kgf/cm ² }
2	Maximum operating pressure: 14MPa{143kgf/cm ² }

Bellows _____

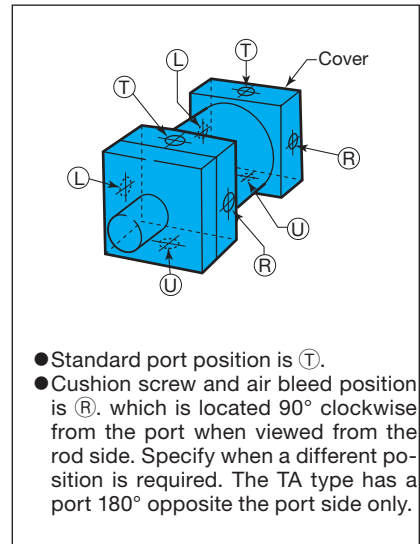
A	Conex
C	Silicon
J	Nylon/tarpaulin (standard)
K	Neoprene
None	None

Cylinder I.D. _____

Rod diameter (Rod B and Rod C) _____

Cylinder stroke _____

Design number _____
 Cushion, air bleeder position _____
 Port position _____



Stroke up to 1000mm is standard. See the following table for strokes greater than 1000mm.

Series Inside diameter	30-40		50 to 150		180 to 250	
	7MPa{71.4kgf/cm ² }	1500	2000	1500	1501 to 2000	
14MPa{143kgf/cm ² }	1500	2000	800	801 to 2000		
Cover Fixing System	Tie Rod			Screw In Flange		

Note) 1. Use a Nomograph to determine rod buckling.
 2. With the screw in flange system, the tube and flange are fixed by being screwed in.

● Handling

Note the following installation and handling precautions to get the most out of cylinder performance and to obtain the long service life for which cylinders are designed.

- Cylinders are designed for rigidity. Be sure to secure them in place with bolts.
- Install cylinders in a location that allows their easy removal, maintenance, and inspection.

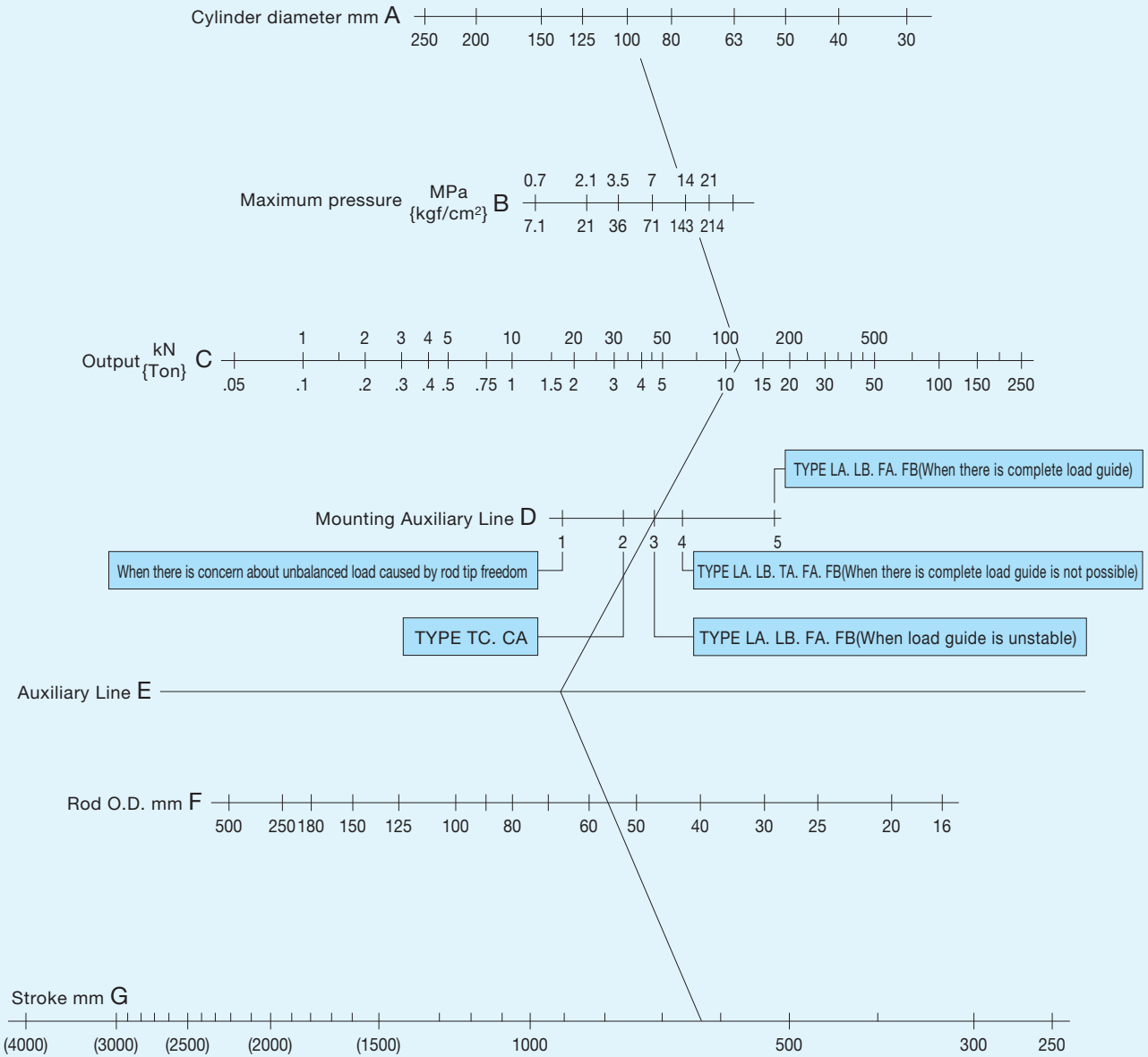
- When installing a cylinder in a location where the air quality is poor, or where there are large amounts of dust, metal powder, or other contaminants, install dust covers on the rod and shell to protect them.
- When installing a cylinder, align it with the center of the slide, and make sure it is not subjected to lateral or rotational force by the piston or rod. When lateral force is unavoidable,

- make sure it does not exceed 1/100 of cylinder maximum output.
- When coupling the piston rod and machinery, adjust so there is no unnecessary force applied to the piston rod sliding bush.

Nomograph

(Operation Conditions, Load, Rod, Stroke)

- Back Ring Safety Factor 4 According to Euler Equation



Note) TC type is intermediate trunnion type

Nomograph Application Example

Determining Maximum Stroke

The maximum stroke under the following operating conditions can be easily determined as shown below.

Operating Environment

- Cylinder I.D. : ϕ 100mm
- Maximum Working Pressure: 14MPa{143kgf/cm²}
- Mounting Method : FA type (Rod Side Flange)
- Load Guide Condition : Unstable
- Piston Rod Diameter : 56mm

Determining Maximum Stroke

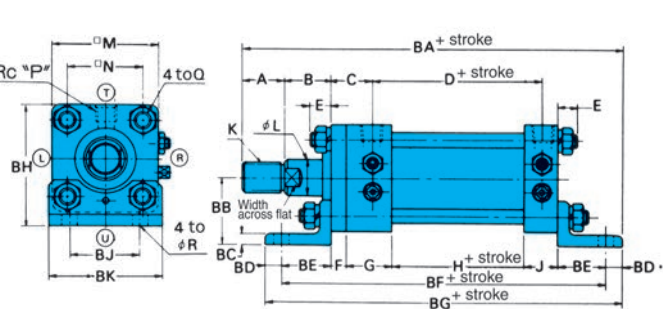
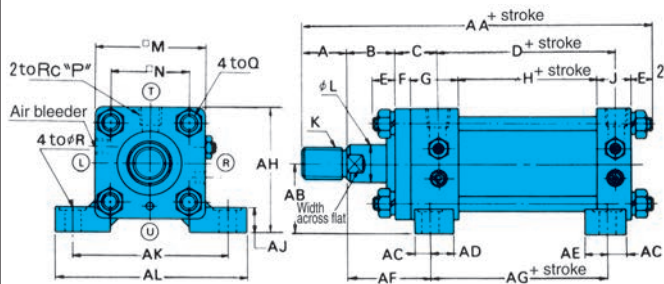
- 1 Draw a line through 100mm on Line A (Cylinder I.D.) and 14 on Line B (Maximum Pressure), and extend it to Line C (Output). The point of intersection on Line C is at 110kN.
- 2 Draw a line from 100kN on Line C to point 3 (FA type, unstable load guide) on Line D (Mounting Type Auxiliary Line), and then extend the line until it intersects with Line E.

- 3 Draw a line from the point of intersection on Line E to 56mm on Line F (Rod Diameter) and then extend the line until it intersects with Line G (Stroke). This indicates a maximum stroke of about 630mm.

Installation Dimension Drawings

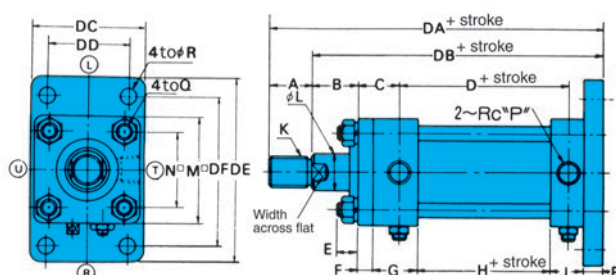
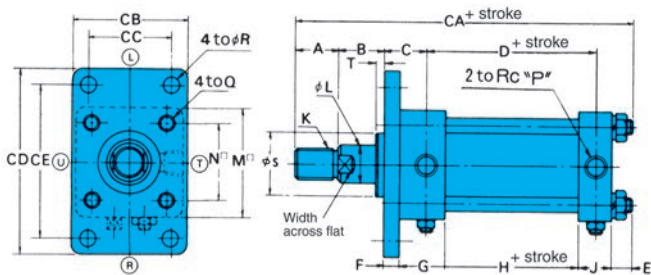
LA Type 7MPa{71.4kgf/cm²}-14MPa{143kgf/cm²}

LB Type 7MPa{71.4kgf/cm²}

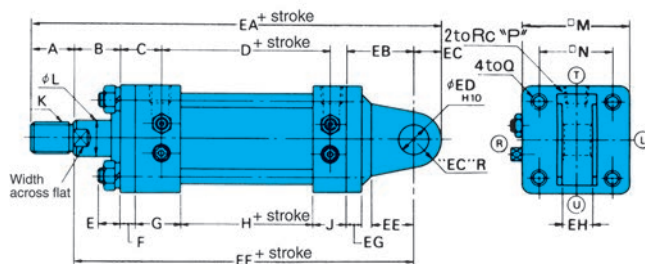


FA Type 7MPa{71.4kgf/cm²}

FB Type 7MPa{71.4kgf/cm²}

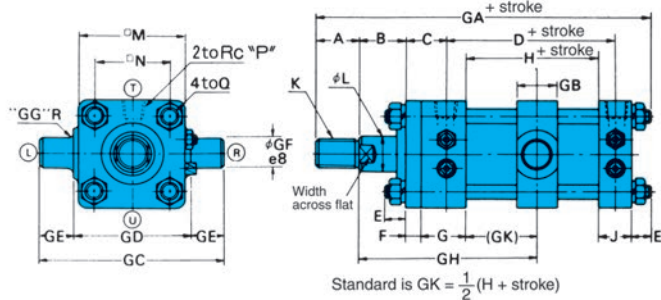
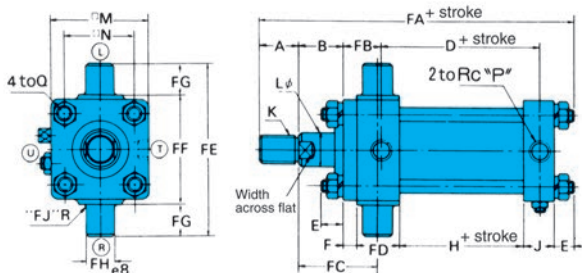


CA Type 7MPa{71.4kgf/cm²}-14MPa{143kgf/cm²}



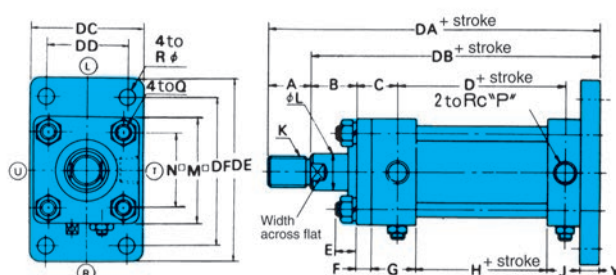
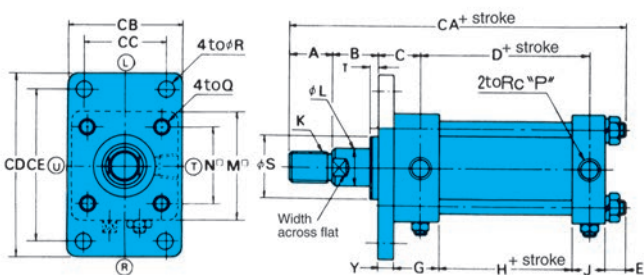
TA Type 7MPa{71.4kgf/cm²}-14MPa{143kgf/cm²}

TC Type 7MPa{71.4kgf/cm²}-14MPa{143kgf/cm²}



FY Type 7MPa{71.4kgf/cm²}-14MPa{143kgf/cm²}

FZ Type 7MPa{71.4kgf/cm²}-14MPa{143kgf/cm²}

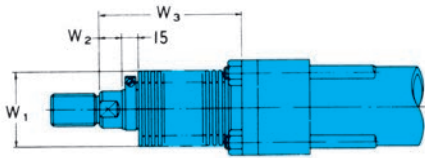


K Hydraulic Cylinder

● Rod Cover Mounting Method

Symbol		Inside diameter													
		30	40	50	63	80	100	125	140	150	160	180	200	224	250
W ₁	Rod diameter B	50	50	60	70	80	100	120	130	140	140	150	170	180	200
	C	—	50	50	60	70	80	100	120	130	—	—	—	—	—
W ₂		20	20	20	30	30	30	40	40	40	40	40	40	50	50
W ₃		45+ $\frac{ST}{3.5}$	45+ $\frac{ST}{3.5}$	45+ $\frac{ST}{3.5}$	55+ $\frac{ST}{4}$	55+ $\frac{ST}{4}$	55+ $\frac{ST}{4}$	65+ $\frac{ST}{5}$	65+ $\frac{ST}{5}$	65+ $\frac{ST}{5}$	65+ $\frac{ST}{5}$	65+ $\frac{ST}{5}$	65+ $\frac{ST}{5}$	80+ $\frac{ST}{6}$	80+ $\frac{ST}{6}$

ST is stroke.



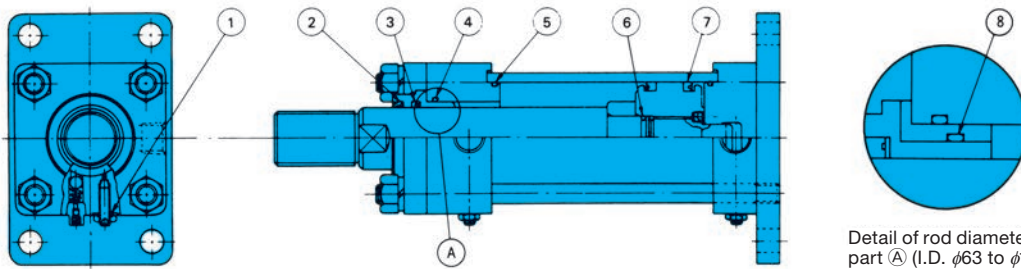
Note) 1. The decimal part of the W₃ dimension is rounded down.

2. This diagram shows dimensions for nylon tarpaulin (Standard: 80°C max. heat resistance), neoprene (130°C max. heat resistance), silicon (220°C max. heat resistance), and conex (300°C max. heat resistance), which are used with the standard FJ cylinder. Heat resistance does not indicate constant temperature, but maximum temperature within a short period. Asbestos/aluminum (400°C max. heat resistance) and other materials are also available, and using such materials changes the W₃ dimension. Contact your agent for more information.

3. Use a heat wall when there is particularly intense heat radiation due to ambient temperature. Also avoid high temperatures due to heat conduction.

4. When a rod cover is required, specify with the symbol described in the section that explains model numbers.

● Packing Type List



Note) O-ring 1A/B-** refers to JIS B2401-1A/B.

Rod Diameter Rod B

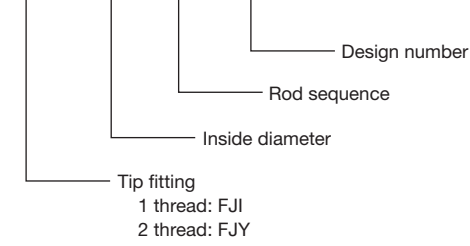
Part No.	1	2	3	4	5	6	7
Cylinder I.D.	Cushion Valve Nominal Diameter Screw Seat Packing (Fujikoshi)(Qty: 2)	Dust Seal SDR Type I.D. × O.D. × Height (Qty: 1)	Gland Packing SKY Type I.D. × O.D. × Height (Qty: 1)	Gland Bush Nominal Diameter (Qty: 1)	Cover Nominal Diameter (Qty: 2)	Piston I.D. Nominal Diameter (Qty: 1)	Piston Packing SKY Type I.D. × O.D. × Height (Qty: 2)
30	M10P1.5×3.5	18×26×4.5×6	18×26×5	1A-G30	1B-G25	1A-P14	22.4×30×5
40	M10P1.5×3.5	22.4×30.4×4.5×6	22.4×30×5	1A-G30	1B-G35	1A-P15	30×40×6
50	M10P1.5×3.5	28×36×4.5×6	28×35.5×5	1A-G35	1B-G45	1A-P20	40×50×6
63	M10P1.5×3.5	35.5×43.5×5×6.5	35.5×45×6	1A-G45	1B-G58	1A-G25	53×63×6
80	M10P1.5×3.5	45×53×5×6.5	45×55×6	1A-G55	1B-G75	1A-P32	71×80×6
100	M10P1.5×3.5	56×64×5×6.5	56×66×6	1A-G65	1B-G95	1A-G35	85×100×9
125	M10P1.5×3.5	71×81×6×8	71×80×6	1A-G80	1B-G120	1A-G45	112×125×8.5
140	M10P1.5×3.5	80×90×6×8	80×90×6	1A-G90	1B-G135	1A-G50	125×140×9
150	M10P1.5×3.5	85×95×6×8	85×100×9	1A-G95	1B-G145	1A-G55	136×150×8.5
160	M16P1.5×4.5	90×100×6×8	90×105×9	1A-G105	1B-G150	1A-G60	145×160×9
180	M16P1.5×4.5	100×110×6×8	100×115×9	1A-G115	1B-G170	1A-G70	165×180×9
200	M16P1.5×4.5	112×122×6×8	112×125×8.5	1A-G125	1B-G190	1A-G80	180×200×12
224	M16P1.5×4.5	125×138×7×9.5	125×140×9	1A-G140	1B-G214	1A-G90	204×224×12
250	M16P1.5×4.5	140×153×7×9.5	140×155×9	1A-G155	1B-G240	1A-G100	230×250×12

Rod Diameter Rod C

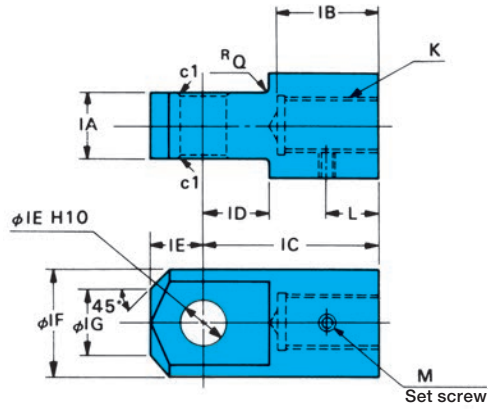
Part No.	1	2	3	4	5	6	7	8
Cylinder I.D.	Cushion Valve Nominal Diameter Screw Seat Packing (Fujikoshi)(Qty: 2)	Dust Seal SDR Type I.D. × O.D. × Height (Qty: 1)	Gland Packing SKY Type I.D. × O.D. × Height (Qty: 1)	Gland Bush Nominal Diameter (Qty: 1)	Cover Nominal Diameter (Qty: 2)	Piston I.D. Nominal Diameter (Qty: 1)	Piston Packing SKY Type I.D. × O.D. × Height (Qty: 2)	Bush Nominal Diameter (Qty: 1)
40	M10P1.5×3.5	18×26×4.5×6	18×26×5	1A-G30	1B-35	1A-P15	30×40×6	—
50	M10P1.5×3.5	22.4×30.4×4.5×6	22.4×30×5	1A-G35	1B-45	1A-P20	40×50×6	—
63	M10P1.5×3.5	28×36×4.5×6	28×35.5×5	1A-G45	1B-58	1A-G25	53×63×6	1A-G35
80	M10P1.5×3.5	35.5×43.5×5×6.5	35.5×45×6	1A-G55	1B-75	1A-P32	71×80×6	1A-G45
100	M10P1.5×3.5	45×53×5×6.5	45×55×6	1A-G65	1B-95	1A-G35	85×100×9	1A-G55
125	M10P1.5×3.5	56×64×5×6.5	56×66×6	1A-G80	1B-120	1A-G45	112×125×8.5	1A-G65
140	M10P1.5×3.5	63×71×5×6.5	63×73×6	1A-G90	1B-135	1A-G50	125×140×9	1A-G75
150	M10P1.5×3.5	67×75×5×6.5	67×77×6	1A-G95	1B-145	1A-G55	136×150×8.5	1A-G80

● Tip Cap

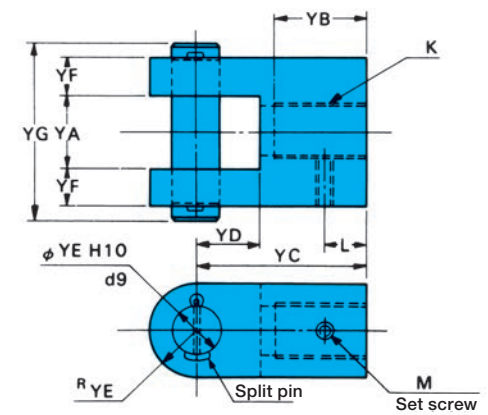
FJI - 40 - B - 10



1-Fork Tip Cap



2-Fork Tip Cap (With Pin)



1-Fork Tip Cap

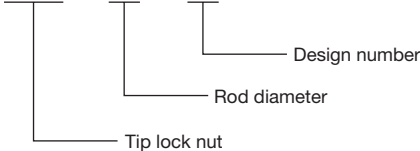
Symbol		Inside diameter									
		30	40	50	63	80	100	125	140	150	
Common	IA	25 ^{-0.1} _{-0.4}	25 ^{-0.1} _{-0.4}	31.5 ^{-0.1} _{-0.4}	40 ^{-0.1} _{-0.4}	40 ^{-0.1} _{-0.4}	50 ^{-0.1} _{-0.4}	63 ^{-0.1} _{-0.4}	80 ^{-0.1} _{-0.6}	80 ^{-0.1} _{-0.6}	
	IC	50	55	65	92	107	135	168	210	215	
	ID	20	20	25	40	40	50	63	80	80	
	IE	16	16	20	31.5	31.5	40	50	63	63	
	IF	35	35	45	65	65	85	105	130	130	
	IG	25	25	32	40	40	55	68	85	85	
	L	15	15	15	15	15	20	20	20	20	
	M	M8	M8	M8	M8	M8	M10	M10	M10	M10	
	Q	2	2	2.5	2.5	2.5	3	3	4	4	
Rod diameter	Rod B	IB	27	32	37	47	62	78	98	113	118
	Rod C	K	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M64 P2	M72 P2	M76 P2
Rod diameter	Rod B	IB	—	27	32	37	47	62	78	83	88
	Rod C	K	—	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M56 P2	M60 P2

2-Fork Tip Cap

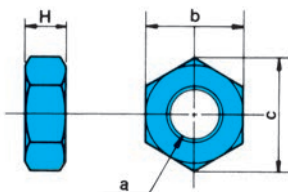
Symbol		Inside diameter									
		30	40	50	63	80	100	125	140	150	
Common	YA	25 ^{+0.4} _{+0.1}	25 ^{+0.4} _{+0.1}	31.5 ^{+0.4} _{+0.1}	40 ^{+0.4} _{+0.1}	40 ^{+0.4} _{+0.1}	50 ^{+0.4} _{+0.1}	63 ^{+0.4} _{+0.1}	80 ^{+0.6} _{+0.1}	80 ^{+0.6} _{+0.1}	
	YC	50	55	65	92	107	135	168	210	215	
	YD	20	20	25	40	40	50	63	80	80	
	YE	16	16	20	31.5	31.5	40	50	63	63	
	YF	12.5	12.5	16	20	20	25	31.5	40	40	
	YG	66	66	80	101	101	126	153	192	192	
	L	15	15	15	15	15	20	20	20	20	
	M	M8	M8	M8	M8	M8	M10	M10	M10	M10	
	YB	27	32	37	47	62	78	98	113	118	
Rod diameter	Rod B	YB	27	32	37	47	62	78	98	113	118
	Rod C	K	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M64 P2	M72 P2	M76 P2
Rod diameter	Rod B	YB	—	27	32	37	47	62	78	83	88
	Rod C	K	—	M16 P1.5	M20 P1.5	M24 P1.5	M30 P1.5	M39 P1.5	M48 P1.5	M56 P2	M60 P2

Locknut Type Description (Example)

FJN - 28 - 10



Locknut (For FJ)



Symbol		Rod diameter										
		18	22.4	28	35.5	45	56	63	67	71	80	85
a	M16	M20	M24	M30	M39	M48	M56	M60	M64	M72	M76	
	P1.5	P1.5	P1.5	P1.5	P1.5	P1.5	P2	P2	P2	P2	P2	
b	24	30	36	46	60	75	85	90	95	105	110	
c	27.7	34.6	41.6	53.1	69.3	86.5	98.1	104	110	121	127	
H	10	12	14	18	23	29	34	36	38	42	46	



NCP Series Standard Variable Pump Unit

NCP Series is a compact, low-cost standard unit that includes a variable vane pump (VDR, VDC Series) or a variable piston pump (PVS/PZS Series). The power unit is low-noise, low-heat, energy-efficient, and highly reliable. The NCP Series has been expanded to include a choice of models that are optimized for a very wide range of needs. Available tank capacities range from 30ℓ to 650ℓ.

Features

Low energy, high efficiency

A built-in low-noise, high-efficiency NACHI variable pump ensures low-heat, high-efficiency, low-energy operation.

A rich range of options

A full selection of options include base block, cooler, terminal box, microseparator, oil pan, return filter, and more, so you can configure a unit that meets your particular needs.

A selection of versatile circuits

Virtually any type of circuit can be configured using ganged type NACHI modular valves.

Low cost, short lead time

Components are all standard and mass produced, so parts are readily available at low prices.

● Handling

- ① All pump rotation is clockwise (rightward) when viewed from the shaft side.
- ② See the table below for information about adjusting discharge volume and pressure.
- ③ For operating fluid, use regular oil equivalent to ISO VG 32 to 68 (Viscosity Index: 90 or greater).

	Adjusting Screw Rotation Direction	Pump type	
		VDC · PVS · PZS	VDR
Pressure	Clockwise	Increase	Decrease
	Counterclockwise	Decrease	Increase
Discharge rate	Clockwise	Decrease	
	Counterclockwise	Increase	

Specifications

- Note) ① For direct connect type, use a Nachi Uni-pump.
 ② Oil temperature limit is room temperature +25°C setting conditions are full cutoff continual operation, tank located in a well-ventilated area.
 ③ An unload circuit is required when the motor is started under condition λ-Δ. Contact your agent about the unload circuit.
 ④ Unless specified otherwise, electrical systems and paint colors are NACHI standards (see page L-13).

Variable Vane Pump Series

Power supply for all types is 200V AC.

Model No.	Pump Model No.	Connection	Motor (All External) kW, 4P	Tank Capacity ℓ	Full Cutoff Pressure at Tank Oil Temperature Limit (Note 3) MPa(kgf/cm ²)			Approximate Weight kg
					No Fan Cooler	With Standard Fan Cooler	With Highpower Fan Cooler	
(VC1A2) NCP-40-0.7VD1A2-□-13(22)	(VDC-1B-1A*-20) VDR-1B-1A*-22	Direct	0.75	40	3.0 (30.6)	8.0 (81.6)	—	75
(VC1A*) NCP-60-VD1A*-□-13(22)	(VDC-1B-1A*-20) VDR-1B-1A*-22	Direct	1.5 2.2 3.7	60	4.5 (45.9)	9.0 (91.8)	—	95 110 130
(VC1A3) NCP-100-3.7VD1A3-C-13(22)	(VDC-1B-2A3-20) VDR-1B-2A3-22	Direct	3.7	100	7.0 (71.4)	—	—	165
2A* NCP-160-VC2A*-□-13	VDC-2A-1A*-20 2A*	Coupling	5.5 7.5 11	160	3.5 (35.7)	6.5 (66.3)	8.5 (86.7)	255 265 315
2A* NCP-250-VC2A*-□-13	VDC-2A-1A*-20 2A*	Coupling	7.5 11 15	250	4.5 (45.9)	7.0 (71.4)	9.5 (96.9)	315 365 395
NCP-400-VC3A*-□-13	VDC-3A-1A*-20	Coupling	7.5 11 15 18.5 22	400	4.5 (45.9)	7.0 (71.4)	8.5 (86.7)	490 520 545 615 645
NCP-650-VC3A*-□-13	VDC-3A-1A*-20	Coupling	11 15 18.5 22 30	650	6.0 (61.2)	8.5 (86.7)	10.0 (102.0)	615 640 715 740 805

- Note) 1. Contact your agent when mounting motors enclosed in parentheses. These motors require special handling concerning operating pressure, heat generation, etc.
 2. Equip a return filter for pressures of 7MPa or greater.
 3. A radiator is equipped as standard with the 100ℓ type.

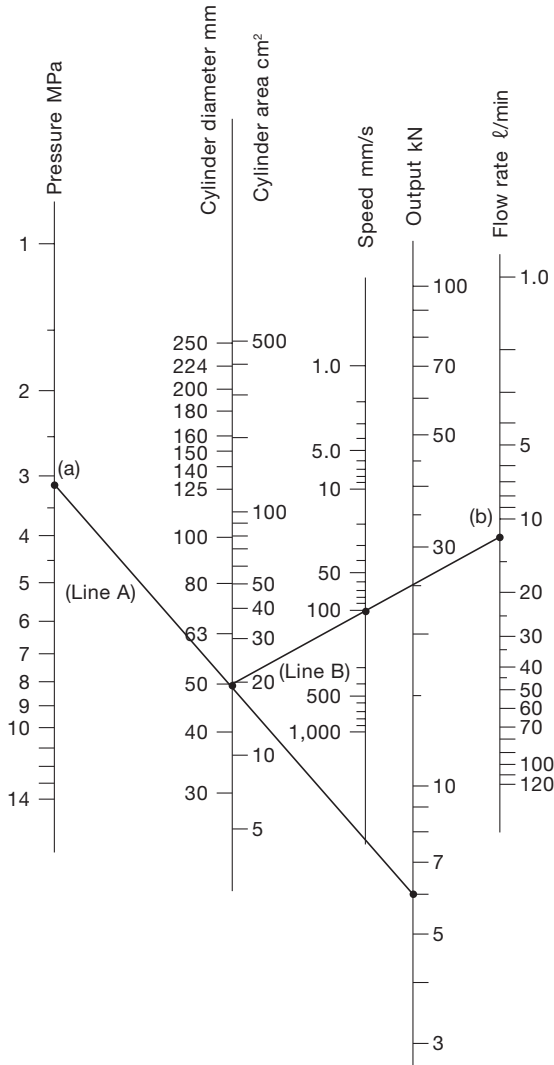
Variable Piston Pump Series

Power supply for all types is 200V AC.

Model No.	Pump Model No.	Connection	Motor (All External) kW, 4P	Tank Capacity ℓ	Full Cutoff Pressure at Tank Oil Temperature Limit (Note 3) MPa(kgf/cm ²)			Approximate Weight kg
					No Fan Cooler	With Standard Fan Cooler	With Highpower Fan Cooler	
NCP-30-PV8N*-R-13	PVS-0B-8N*-30	Direct	0.75 1.5	30	5.0 (51.0)	—	—	50 55
NCP-40-PV8N*-R-13	PVS-0B-8N*-30	Direct	0.75 1.5	40	5.0 (51.0)	21.0 (214.1)	—	80 85
NCP-60-PV8N*-R-13	PVS-0B-8N*-30	Direct	1.5 2.2 3.7	60	7.0 (71.4)	21.0 (214.1)	—	95 110 130
NCP-40-PV16N*-R-13(22)	PVS-1B-16N*-12	Direct	0.75 1.5	40	4.5 (45.9)	21.0 (214.1)	—	80 85
NCP-60-PV16N*-R-13(22)	PVS-1B-16N*-12	Direct	1.5 2.2 3.7	60	7.0 (71.4)	21.0 (214.1)	—	95 110 130
16 NCP-100-PV22N*-R-13(22)	PVS-1B-22N*-12	Coupling	3.7 5.5 7.5	100	8.5 (86.7)	21.0 (214.1)	—	155 185 200
NCP-160-PV35N*-R-13	PVS-2B-35N*-12	Coupling	5.5 7.5 11	160	7.0 (71.4)	14.0 (142.7)	21.0 (214.1)	250 260 310
NCP-250-PV45N*-R-13	PVS-2B-45N*-12	Coupling	7.5 11 15	250	9.5 (96.9)	17.0 (173.3)	21.0 (214.1)	310 360 390
NCP-400-PV70N*-R-13	PZS-3B-70N*-10	Coupling	7.5 11 15 18.5 22	400	5.5 (56.1)	14.0 (142.7)	16.0 (163.1)	505 540 565 635 660
NCP-650-PV70N*-R-13	PZS-3B-70N*-10	Coupling	11 15 18.5 22 30	650	8.5 (86.7)	16.0 (163.1)	18.0 (183.5)	635 660 735 760 825

Note) All models in this series are equipped with a return filter as standard.

NCP Series Selection Chart



Flow rate ℓ/min	Area	Pressure MPa	NCP Series Model	
			Variable Vane Pump Series	Variable Piston Pump Series
5		3.5 to 5.0		NCP-30-0.7V8N1-R-13
10		4.5 to 8.0 8.0 to 14.0		NCP-40-1.5PV16N2-CR-13(22) -60-2.2PV16N2-CR-13(22)
15	50/60Hz	1.0 to 3.0 3.0 to 4.5 4.5 to 7.0 7.0 to 14.0	NCP-40-0.7V ^① A2-13(22) -60-1.5V ^① A3-13(22)	NCP-60-2.2PV16N1-R-13(22) -60-3.7PV16N2-CR-13(22)
20		1.0 to 3.0 3.0 to 5.0 5.0 to 10.0 10.0 to 14.0	NCP-40-0.7V ^① A2-13(22) -60-1.5V ^① A3-13(22)	NCP-60-3.7PV16N2-(C)R-13(22) NCP-100-5.5PV16N2-CR-13(22)
25	50Hz	1.0 to 3.0 3.0 to 5.0 5.0 to 12.0 12.0 to 14.0	NCP-60-1.5V ^① A2-13(22) -100-3.7V ^① A3-C-13(22)	NCP-100-5.5PV22N2-(C)R-13(22) -100-7.5PV22N2-CR-13(22) ★
	60Hz	1.0 to 3.5 3.5 to 5.0 5.0 to 12.0 12.0 to 14.0	NCP-60-1.5V ^① A2-13(22) -60-2.2V ^① A3-C-13(22)	NCP-100-5.5PV16N2-(C)R-13(22) -100-7.5PV16N2-CR-13(22)
30	50/60Hz	1.0 to 3.5 3.5 to 5.0 5.0 to 8.0 8.0 to 14.0	NCP-60-2.2V ^① A2-13(22) -100-3.7V ^① A3-C-13(22)	NCP-100-5.5PV22N2-(C)R-13(22) -100-7.5PV22N2-CR-13(22) ★
35	50Hz	2.0 to 7.0 7.0 to 10.5 10.5 to 14.0	NCP-160-5.5VC2A3-(C)-13	NCP-160-7.5PV35N2-CR-13 -160-11PV35N2-CR-13 ★
	60Hz	2.0 to 6.0 6.0 to 10.5 10.5 to 14.0	NCP-100-3.7V ^① A3-C-13(22)	NCP-100-7.5PV22N2-CR-13(22)
40		2.0 to 7.0 7.0 to 10.0 10.0 to 14.0	NCP-160-5.5VC2A3-(C)-13	NCP-160-7.5PV35N2-CR-13 -160-11PV35N2-CR-13 ★
50	50/60Hz	2.0 to 5.0 5.0 to 7.0 7.0 to 11.5 11.5 to 14.0	NCP-160-5.5VC ^② A3-(C)-13 -160-7.5VC ^② A3-C-13	NCP-160-11PV35N2-CR-13 -250-15PV45N2-CR-13
60	50Hz	2.0 to 7.0 7.0 to 10.0 10.0 to 14.0		NCP-250-7.5PV45N2-R-13 -250-11PV45N2-CR-13 -250-15PV45N2-CR-13 ★
	60Hz	2.0 to 4.5 4.5 to 7.0 7.0 to 10.0 10.0 to 13.5	NCP-250-5.5VC ^② A3-13 -250-7.5VC ^② A3-C-13	NCP-250-11PV35N2-CR-13 -250-15PV35N2-CR-13
75	50Hz	2.0 to 4.5 4.5 to 7.0 7.0 to 10.0 10.0 to 13.5	NCP-400-7.5VC3A3-13 -400-11VC3A3-C-13	NCP-400-15PV70N3-CR-13 -400-18.5PV70N3-CR-13 ★
	60Hz	2.0 to 5.5 5.5 to 8.0 8.0 to 11.0 11.0 to 13.5		NCP-250-7.5PV45N1-R-13 -250-11PV45N2-(C)R-13 -250-15PV45N2-CR-13 -250-18.5PV45N2-CR-13 ★
90	50/60Hz	2.0 to 4.0 4.0 to 6.5 6.5 to 9.0 9.0 to 11.5 11.5 to 13.5	NCP-400-7.5VC3A3-13 -400-11VC3A3-C-13	NCP-400-15PV70N3-CR-13 -400-18.5PV70N3-CR-13 -400-22PV70N3-CR-13 ★
100	50Hz	2.0 to 6.0 6.0 to 8.0 8.0 to 10.0 10.0 to 12.0 12.0 to 14.0		NCP-650-11PV70N1-R-13 -650-15PV70N3-R-13 -650-18.5PV70N3-CR-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13
	60Hz	2.0 to 6.0 6.0 to 8.0 8.0 to 10.0 10.0 to 12.0 12.0 to 14.0	NCP-650-11VC3A3-13	NCP-650-15PV70N3-R-13 -650-18.5PV70N3-CR-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13
110	60Hz	2.0 to 5.5 5.5 to 7.0 7.0 to 9.0 9.0 to 11.0 11.0 to 14.0	NCP-650-11VC3A3-13 -650-15VC3A3-(C)-13	NCP-650-18.5PV70N3(C)R-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13
120	60Hz	2.0 to 5.0 5.0 to 7.0 7.0 to 8.5 8.5 to 10.0 10.0 to 13.5		NCP-650-11PV70N1-R-13 -650-15PV70N3-R-13 -650-18.5PV70N3-R-13 -650-22PV70N3-CR-13 -650-30PV70N3-CR-13

[Example]

To determine the NCP Series model that drives a $\phi 50$ cylinder with an output of 6kN and speed of 100mm/s.

(a) Draw a line (Line A) between 6kN on the output line and the $\phi 50$ point on the cylinder diameter line. Extend Line A until it intersects with the pressure line at Point (a). Though Point (a) indicates a pressure of 3.1MPa, we need to add about 1MPa to compensate for pressure loss due to piping and other factors, so a pressure of 4MPa is required.

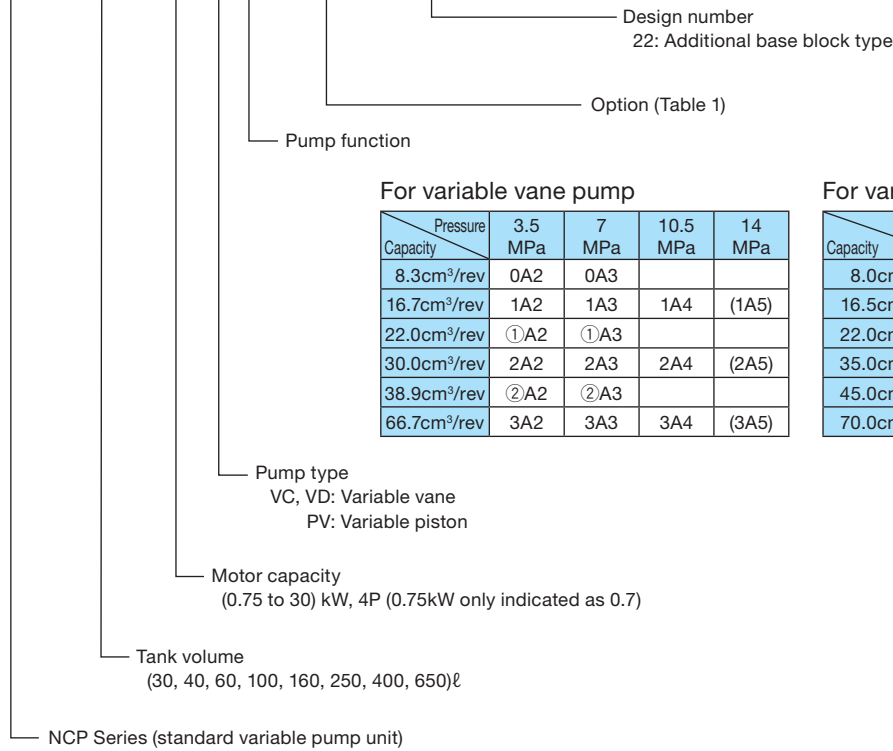
(b) From the $\phi 50$ point on the cylinder diameter line, draw a line (Line B) to the 100 mm/s point on the speed line. Extend Line B until it intersects with the flow rate line at Point (b), which indicates a required flow rate of 11.8 ℓ/min.

(c) Based on the required flow rate of 11.8 ℓ/min. and required pressure of 4MPa obtained above, we can now check the selection chart where we easily find out that the required model is NCP-60-1.5VD1A3-13. Next, select the required option from Table 1 on the following page.

- Note)
- Contact your agent if you need a low-pressure NCP unit with piston pump.
 - If flow rate and pressure are not specified, products are configured with company standard settings before shipping.
 - When running items marked with a star (★) to the right of the table for long periods at pump setting pressure, oil temperature may exceed 60°C even when a fan cooler is used. In this case, use a water cooler.
 - Contact your agent for applications where there is the chance of frequent momentary return flow due to the use of ACC, or surge voltage generated due to the use of fast switching valve response and a high cycle.

Explanation of model No.

NCP - 100 - 3.7 ***** - - 13(22)



For variable vane pump

Capacity	Pressure 3.5 MPa	7 MPa	10.5 MPa	14 MPa
8.3cm ³ /rev	0A2	0A3		
16.7cm ³ /rev	1A2	1A3	1A4	(1A5)
22.0cm ³ /rev	①A2	①A3		
30.0cm ³ /rev	2A2	2A3	2A4	(2A5)
38.9cm ³ /rev	②A2	②A3		
66.7cm ³ /rev	3A2	3A3	3A4	(3A5)

For variable piston pump

Capacity	Pressure 2 to 7MPa	7 to 14MPa
8.0cm ³ /rev	8N1	8N2
16.5cm ³ /rev	16N1	16N2
22.0cm ³ /rev	22N1	22N2
35.0cm ³ /rev	35N1	35N2
45.0cm ³ /rev	45N1	45N2
70.0cm ³ /rev	70N1	70N3

Table 1: Option Symbols

Symbol	Description	Model Number and Description	30L	40 to 100L	160, 250L	400, 650L
B	Base Block (Design No. 13 Only)	MPU Series built-in	○ ^{Note 2}	○	○	○
C	Radiator	N13F-001-1050	○	○		
C1	General-purpose Fan Cooler	3A92-001-0000 16/15W Single-phase 200V AC 50/60Hz		○	○	○
C2	High-power Fan Cooler	3A92-002-0000 35/30W Single-phase 200V AC 50/60Hz			○	○
D	Terminal Wiring (Drive System + Control System)	Wiring from each electrical device to the terminal box (Drive System + Control System)	○	○	○	○
E	Terminal Wiring (Control System Only)	Wiring from each electrical device to the terminal box (Control System Only)	○	○	○	○
F	Mounting Foot for Forklift	See mounting foot for forklift specifications.		○		
M	Microseparator	TMG-1S(to100L), TMG-2ZS(160L to)	○	○	○	○
N	Noise Control	Motor 6P specifications				○
P	Oil pan	See oil pan specifications.		○	○	○
R	Return Filter	WS-20-20-V(20μ paper)	○			
R1	Return Filter	CF-0*(10μ paper) FRS-**-20P**(20μ paper)		○ ^{Note 3}	○ ^{Note 3}	○
R2	Return Filter	FPL-**(10μ paper)		○	○	
T	Temperature Gauge (With Fluid Level Gauge)	φ6 × 80L (0 to 100°C) with guard φ8 × 120L (-20 to 100°C) with guard	○	○	○	○
V	Vibration Control	Anti-vibration rubber, rubber hoses, etc.				○
W1	Self Leak Test	Tank leak test by NACHI		○	○	○
W2	Government-mandated Leak	Test Tank leak test by fire department		○	○	○
TH	Thermostat (Abnormal oil temperature detection: Contact a)	TNS-C1070C (Contact on: 65°C and above)		○	○	○
PS	Pressure Switch (Abnormal pressure detection: Contact a)	CE** Contact ON: (Pump Setting Pressure)-(1.5MPa) and above		○	○	○
FS	Float Switch (Low fluid level detection: Contact a)	OLV-2A Contact on: (Fluid Level Gauge Visual Low Level)-(10mm) or less		○	○	○
G	Fluid Level Gauge Guard	Protective cover installation	○	○	○	○
R3	Return Filter (Tank Top Type)	MAR**-**P-S				
L	Anchor Hole Outer Side	Anchor hole set on outer side				
	Motor Voltage Overseas	Reference Voltage Other than 200V AC 50/60Hz; 220V AC 60Hz				
	Special Paint (Exterior)	Other than standard lacquer paint (phthalates, epoxy, etc.)				
	Piston Pump Variable Control Option	Other than standard control system N (NQ, RS, WS, RQS, etc.)				
	Fire Resistant Operating Fluid (W/G Type)	Water- or glycol-based hydraulic operating fluid (Contact your agent about other fluid types.)				
	Water Cooler	When capacity of pump DR fan cooler is insufficient				
	Electric Oil Heater	When there is the possibility of fluid pressure dropping below 0°C				

- Note) 1.Design 13 when option symbol B is selected. (Base block additional 22 design is not applicable)
 2.With the optional Symbol B capacity 30L, a special base block can be used in a configuration of up to 01 × 3.
 3.Option symbol R1 CF-0* is applicable to pump functions *A2 and *NO only.
 4.FRS-08-20P08T for option symbol R1, capacity 250L using a 45cm³/rev type.
 5.Contact Nachi for information about design number 5100*.

Table 2 The upper and lower limit of the NCP series tank hydraulic fluid level

Tank capacity [L]	Upper limit of hydraulic fluid level [L]	Lower limit of hydraulic fluid level [L]
30	30	24
40	40	31
60	60	49
100	100	80
160	160	111
250	250	184
400	400	306
650	650	522

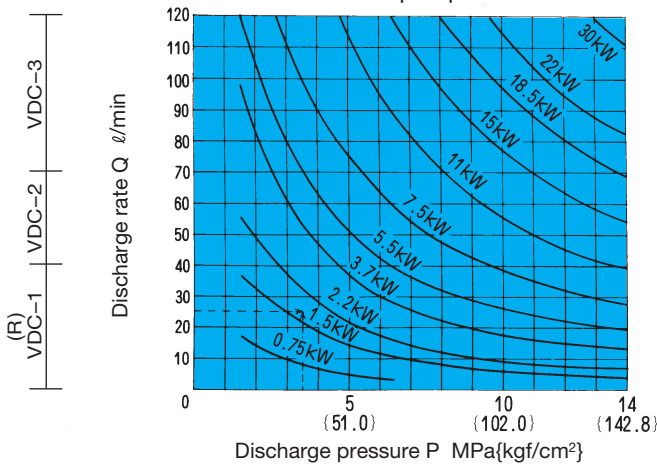
Selecting a Motor

- The lower side of the output curves for each of the motors shown in the graph indicates the operating range under rated output for that motor.
- Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.

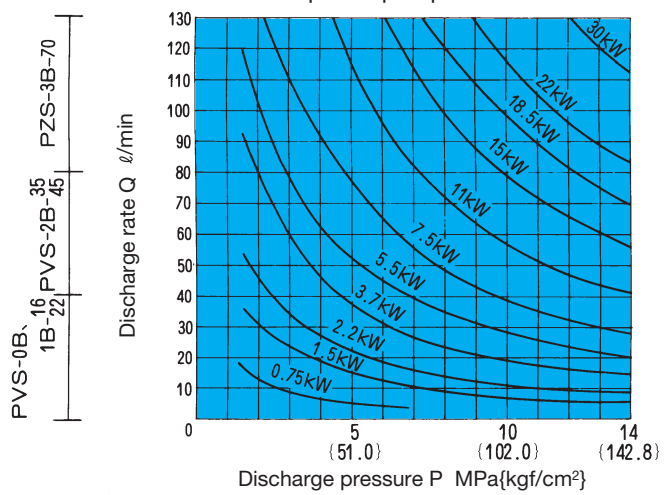
Example: To find the motor that can produce pressure of 3.5MPa {35.7kgf/cm²} and a discharge rate of 25ℓ/min.

Since the intersection of the two broken lines from a pressure of 3.5MPa {35.7kgf/cm²} and discharge rate of 25ℓ/min intersect in the area under the 2.2kW motor should be used.

For variable vane pump



For variable piston pump

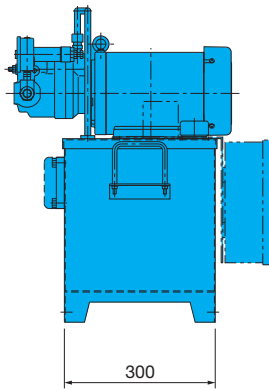
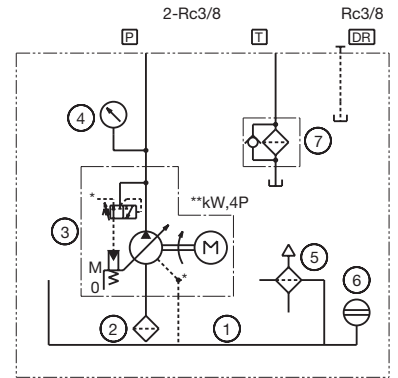
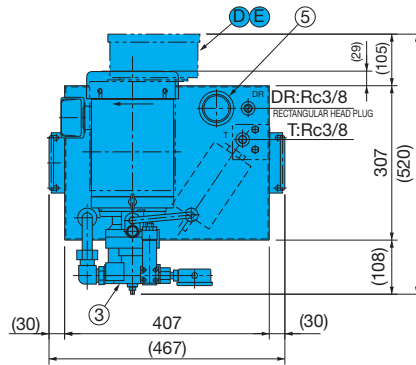


Installation Dimension Drawings

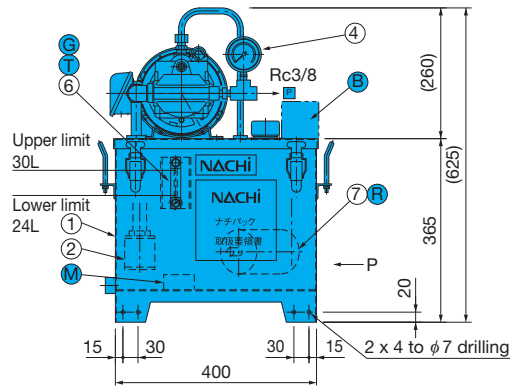
(Note) Catalog dimensions, layout, and used devices are subject to change without notice. In particular, be sure to check in cases where dimensions are limited.

● Mini NCP Series
NCP-30-**PV8N*-*-13

● Option item numbers are colored.



Auxiliary View P

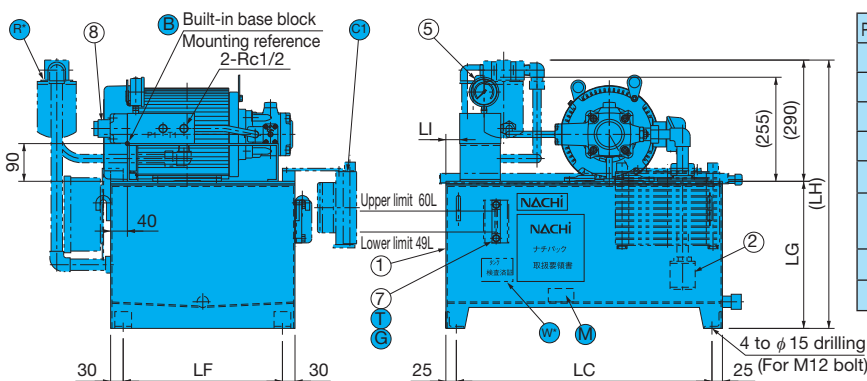
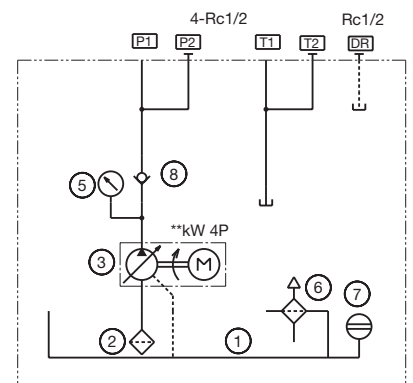
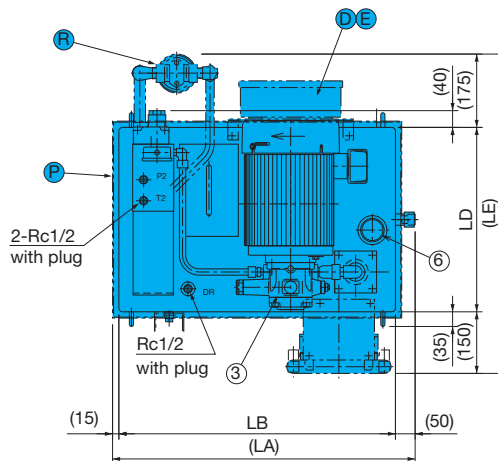


Part No.	Name	Model No.	Q'ty
1	Tank	30ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-0A-8N*-**A-4-50	1
4	Pressure gauge	GV50-173x**MPA	1
5	Fluid supply port/air breather	MSA-V30	1
6	Fluid level gauge	φ6×80L	1
7	Return filter	WS-20-20-V	1

NCP-40-0.7V_D⁰1A2*-13

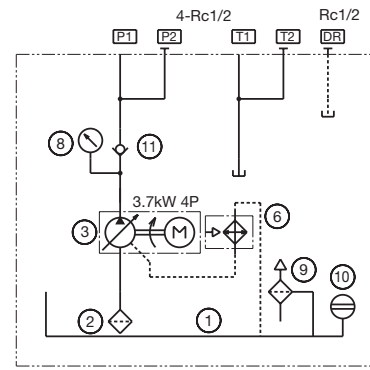
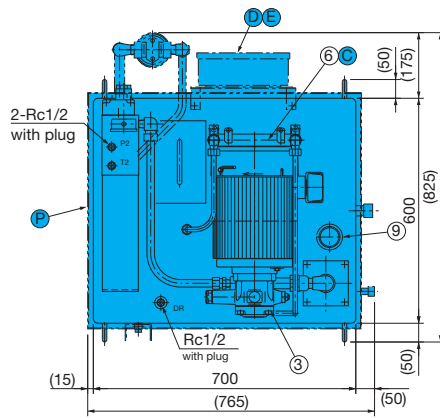
NCP-60-**V_D⁰1A*-13

Symbol	Dimensions (mm)	
	40ℓ	60ℓ
LA	625	725
LB	560	660
LC	510	610
LD	350	440
LE	675	765
LF	290	380
LG	300	350
LH	590	640
LI	31	33

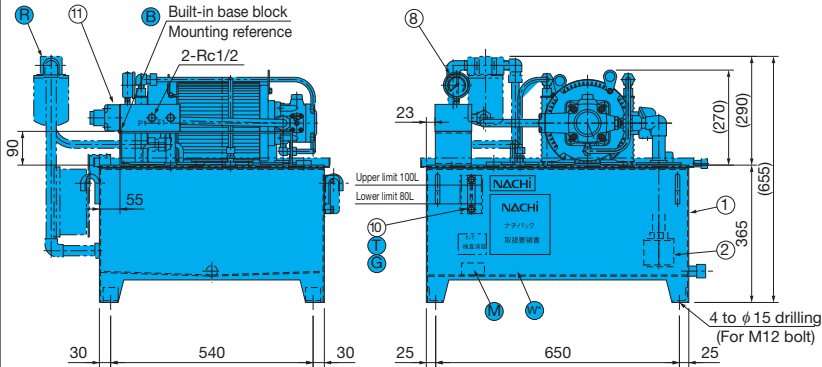


Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UVC(D)-1A-A*-**A-4-40(60)	1
4			
5	Pressure gauge	GV50-173x**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	φ6×80L	1
8	Check valve	CA-G03-1-20	1

NCP-100-3.7V_D1A3-C-13

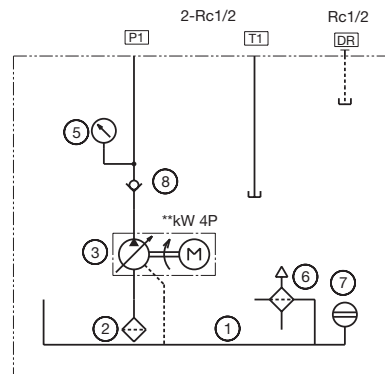
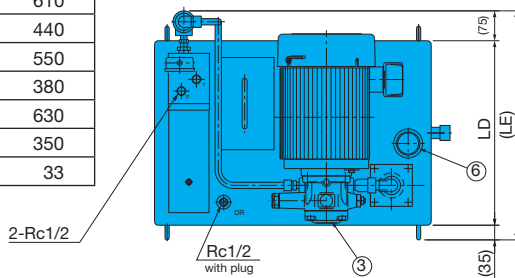


Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-08(150 mesh)	1
3	Uni-pump	UVC(D)-1A-2A3-3.7-4-40(60)	1
4			
5			
6	Radiator	3A92-001-1050	1
7			
8	Pressure gauge	GV50-173x**MPA	1
9	Fluid supply port/air breather	MSA-V30	1
10	Fluid level gauge	φ6×80L	1
11	Check valve	CA-G03-1-20	1

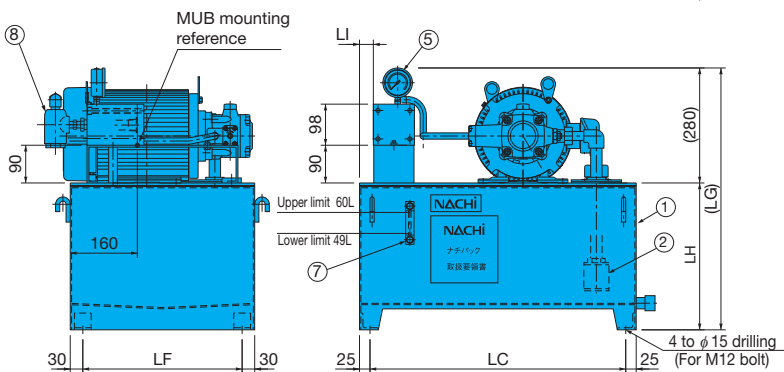


NCP-40-0.7VD1A2*-22
NCP-60-**VD1A*-22

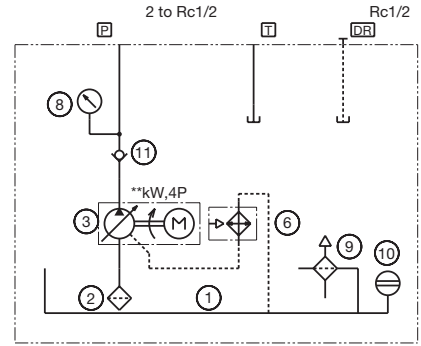
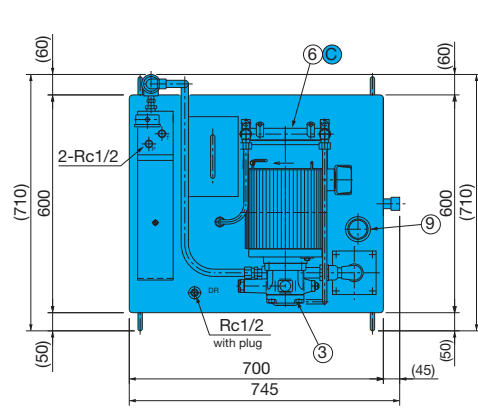
Symbol	Dimensions (mm)	
	40ℓ	60ℓ
LA	605	705
LB	560	660
LC	510	610
LD	350	440
LE	460	550
LF	290	380
LG	580	630
LH	300	350
LI	31	33



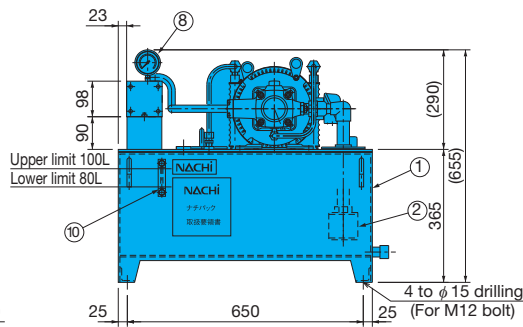
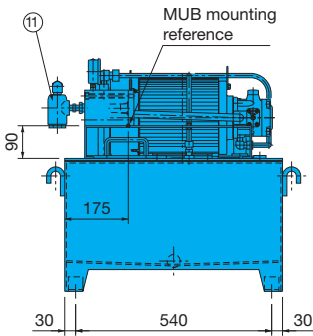
Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UVD-1A-A*-**4-40(60)	1
4			
5	Pressure gauge	GV50-173x**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	φ6×80L	1
8	Check valve	CA-T03-1-20	1



NCP-100-3.7VD1A3-C-22

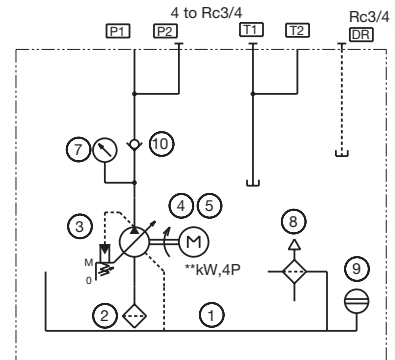
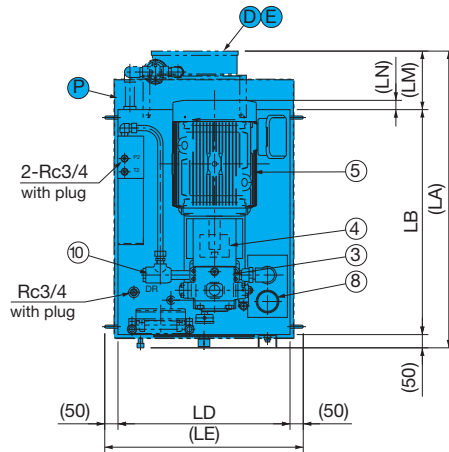


Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-08(150 mesh)	1
3	Uni-pump	UVD-1A-2A3-3.7-4-60	1
4			
5			
6	Radiator	3A92-001-1050	1
7			
8	Pressure gauge	GV50-173x**MPA	1
9	Fluid supply port/air breather	MSA-V30	1
10	Fluid level gauge	φ6x80L	1
11	Check valve	CA-T03-1-20	1

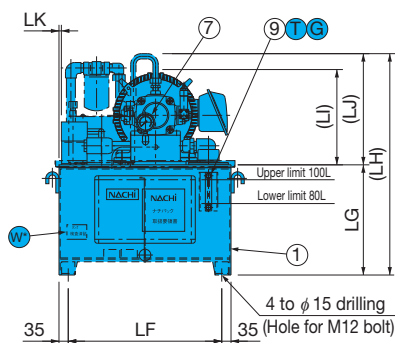
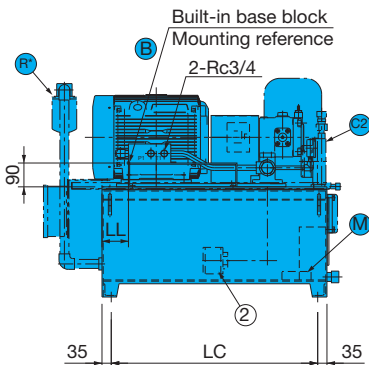


NCP-160-**VC2A*-13
NCP-250-**VC2A*-13

Symbol	Dimensions (mm)	
	160ℓ	250ℓ
LA	1120	1175
LB	850	1000
LC	780	930
LD	650	750
LE	750	850
LF	580	680
LG	415	495
LH	835	995
LI	385	420
LJ	420	500
LK	0	20
LL	100	215
LM	220	125
LN	75	0

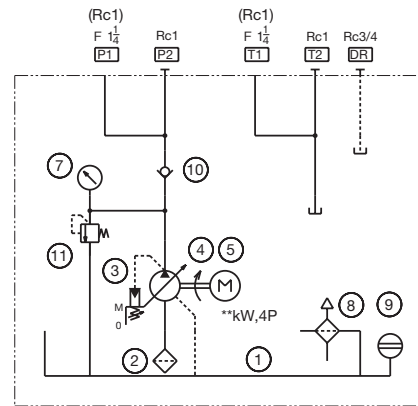
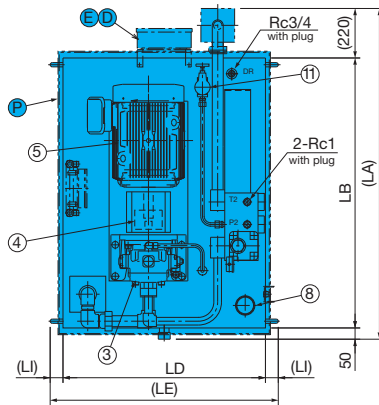


Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-10(150 mesh)	1
3	Pump	VDC-2A*A*-20	1
4	Coupling	CR-***J	1
5	Motor	Fully closed external fan Terminal B **kW-4P	1
6			
7	Pressure gauge	GV50-173x**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	φ8x120L	1
10	Check valve	CA-T06-1-20	1

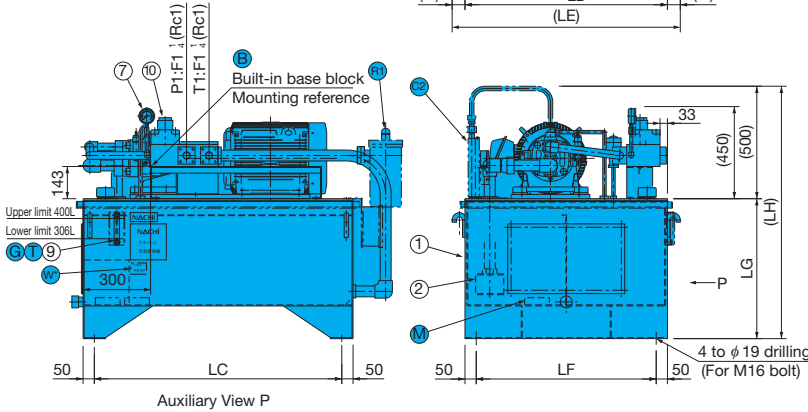


NCP-400-**VC3A*-*-13
 NCP-650-**VC3A*-*-13

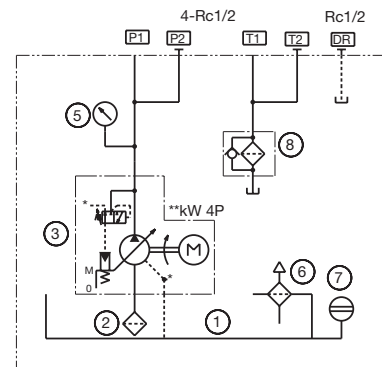
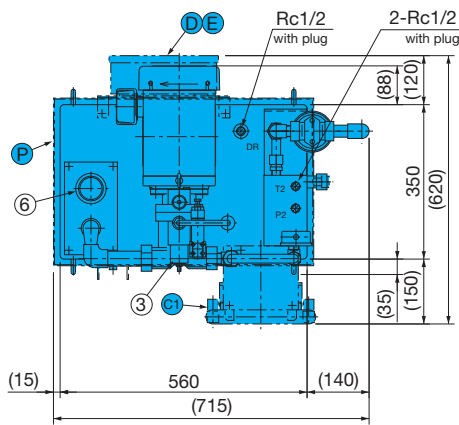
Symbol	Dimensions (mm)	
	400ℓ	650ℓ
LA	1470	1790
LB	1200	1520
LC	1100	1420
LD	900	1010
LE	1014	1164
LF	800	910
LG	620	670
LH	1120	1170
LI	57	77
LJ	300	450



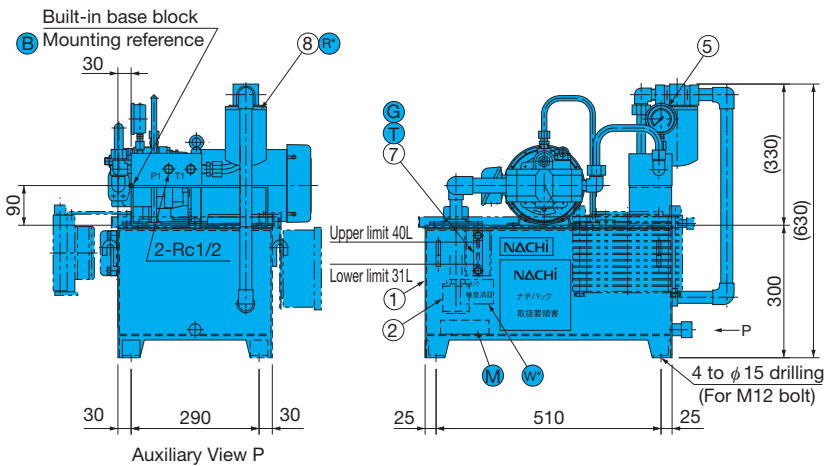
Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-12(150 mesh)	1
3	Pump	VDC-3A-1A*-20	1
4	Coupling	CR-***J	1
5	Motor	Fully closed external fan A terminal **kW-4P	1
6			
7	Pressure gauge	GV50-173**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	φ8×120L	1
10	Check valve	CA-G10-1-20	1
11	Relief valve	R-T03-3-12	1



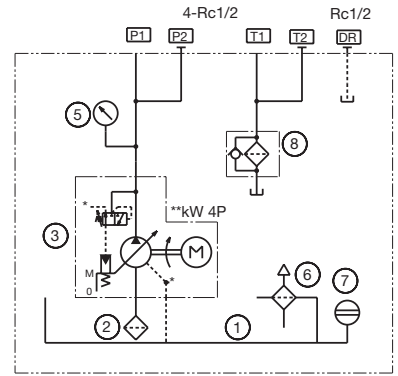
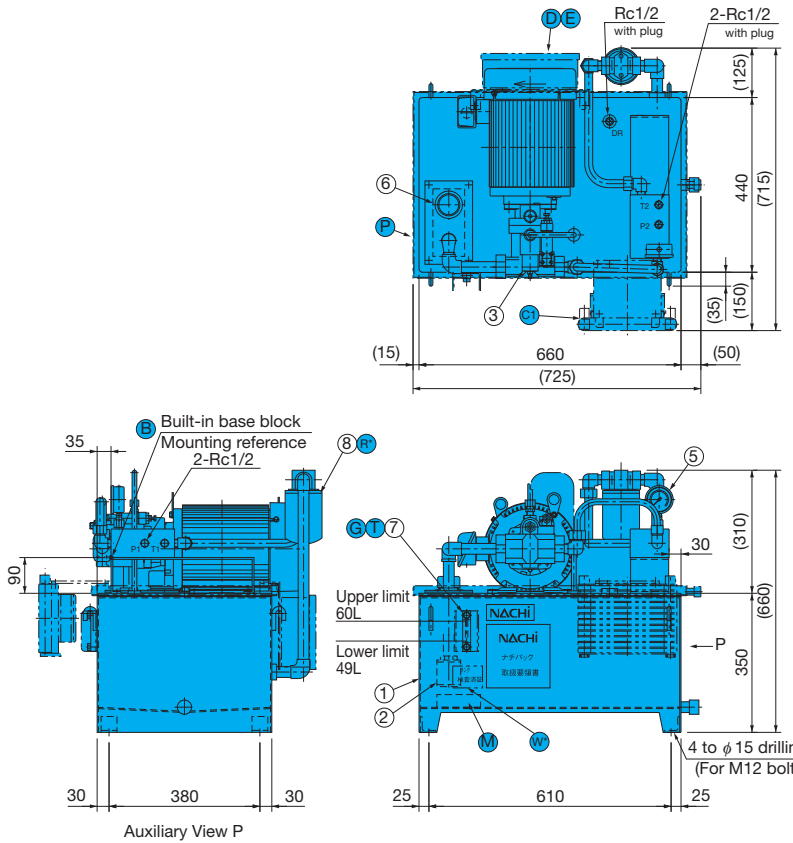
● Variable Piston Pump Series
 NCP-40-**PV₁₆⁸N*-R-13



Part No.	Name	Model No.	Q'ty
1	Tank	40ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-*A-**N*-**A-4-30(50)	1
4			
5	Pressure gauge	GV50-173**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	φ6×80L	1
8	Return filter	(FPL-06)CF-06 10μ paper	1

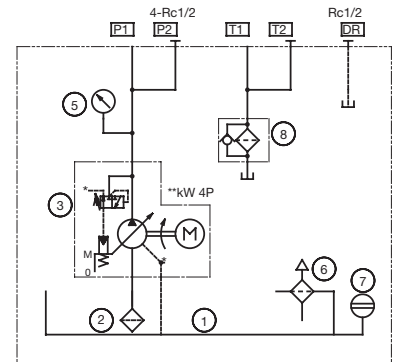
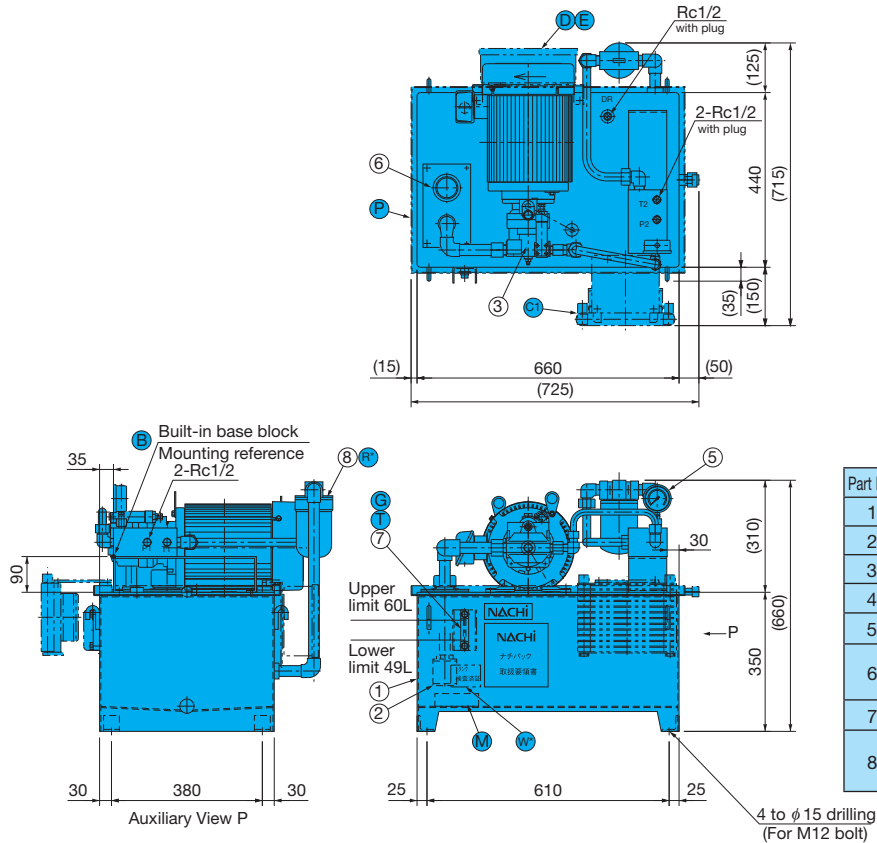


NCP-60-**PV16N*-R-13



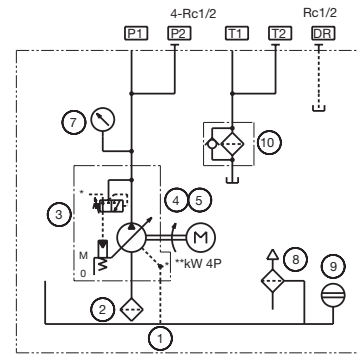
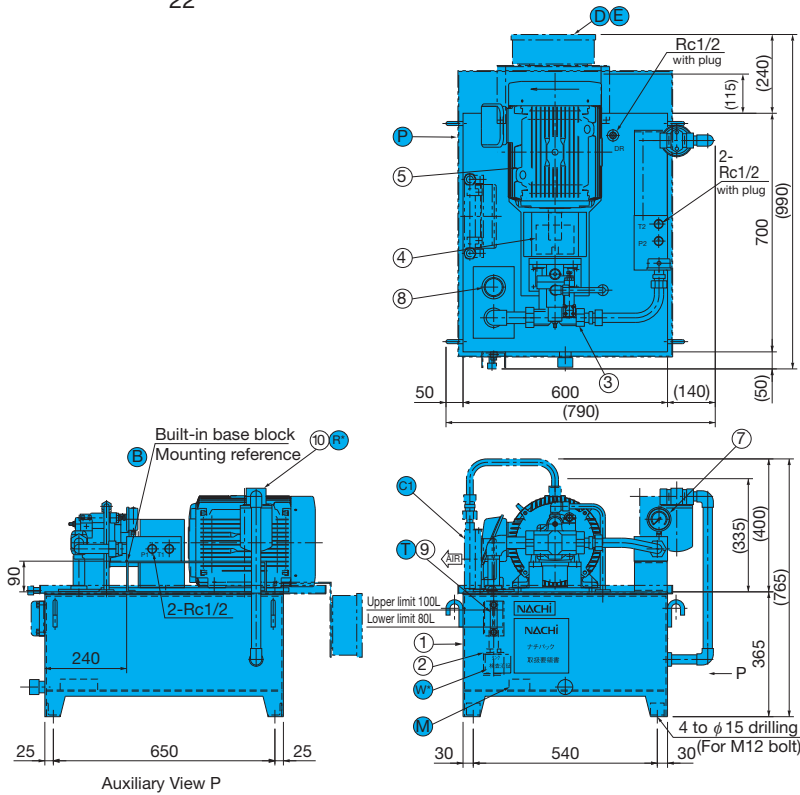
Part No.	Name	Model No.	Q'ty
1	Tank	60ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-1A-16N*-**A-4-30	1
4			
5	Pressure gauge	GV50-173x**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	φ6×80L	1
8	Return filter	(FPL-06)CF-06 10μ paper	1

NCP-60-**PV8N*-*-13



Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-0A-8N*-**A-4-50	1
4			
5	Pressure gauge	GV50-173x**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	φ6×80L	1
8	Return filter	(FPL-06)CF-06 10μ paper	1

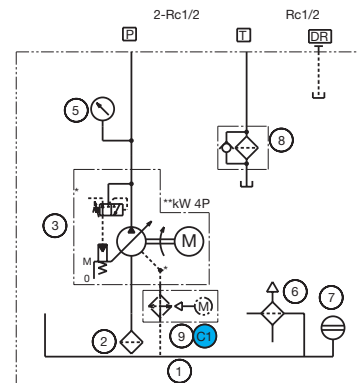
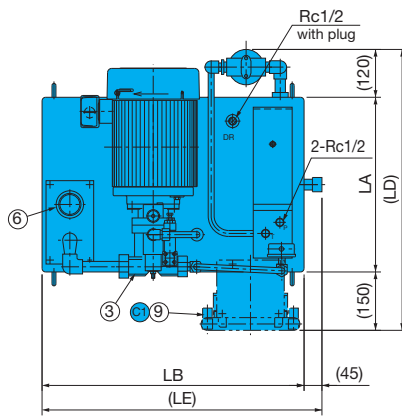
NCP-100-**PV16N***-13



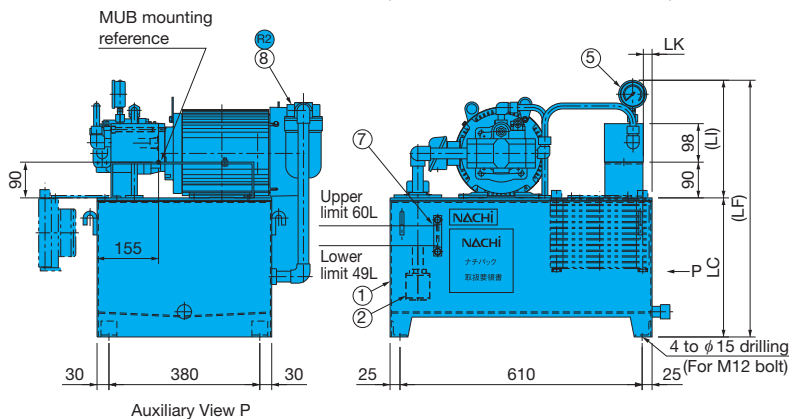
Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Pump	PVS-1A- N *-12	1
4	Coupling	CR- N *J	1
5	Motor	Fully closed external fan A terminal **kW-4P	1
6			
7	Pressure gauge	GV50-173×**MPA	1
8	Fluid supply port/air breather	MSA-V30	1
9	Fluid level gauge	φ6×80L	1
10	Return filter	(FPL-06)CF-06 10μ paper	1

NCP-40-**PV16N***(C1)R2-22
NCP-60-**PV16N***(C1)R2-22

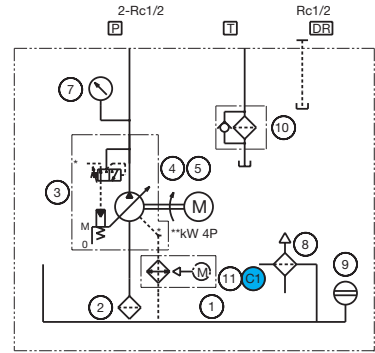
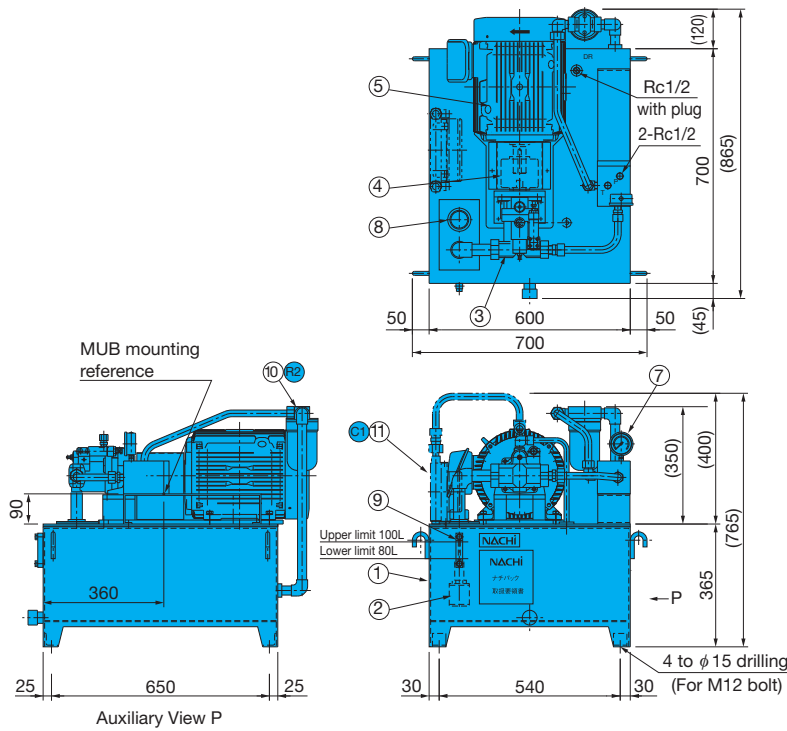
Symbol	Dimensions (mm)	
	40ℓ	60ℓ
LA	350	440
LB	560	660
LC	300	350
LD	620	710
LE	605	705
LF	630	665
LG	290	380
LH	510	610
LI	330	315
LJ	150	155
LK	0	30



Part No.	Name	Model No.	Q'ty
1	Tank	**ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Uni-pump	UPV-1A-16N*- A -4-30	1
4			
5	Pressure gauge	GV50-173×**MPA	1
6	Fluid supply port/air breather	MSA-V30	1
7	Fluid level gauge	φ6×80L	1
8	Return filter	FPL-06(10μ paper)	1
9	Fan cooler	3A92-001-0000	1

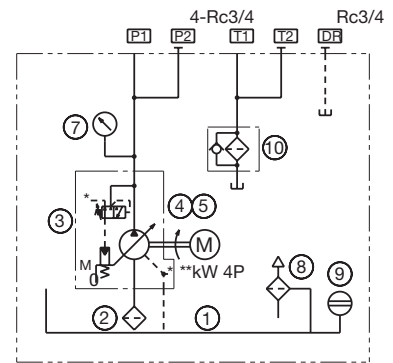
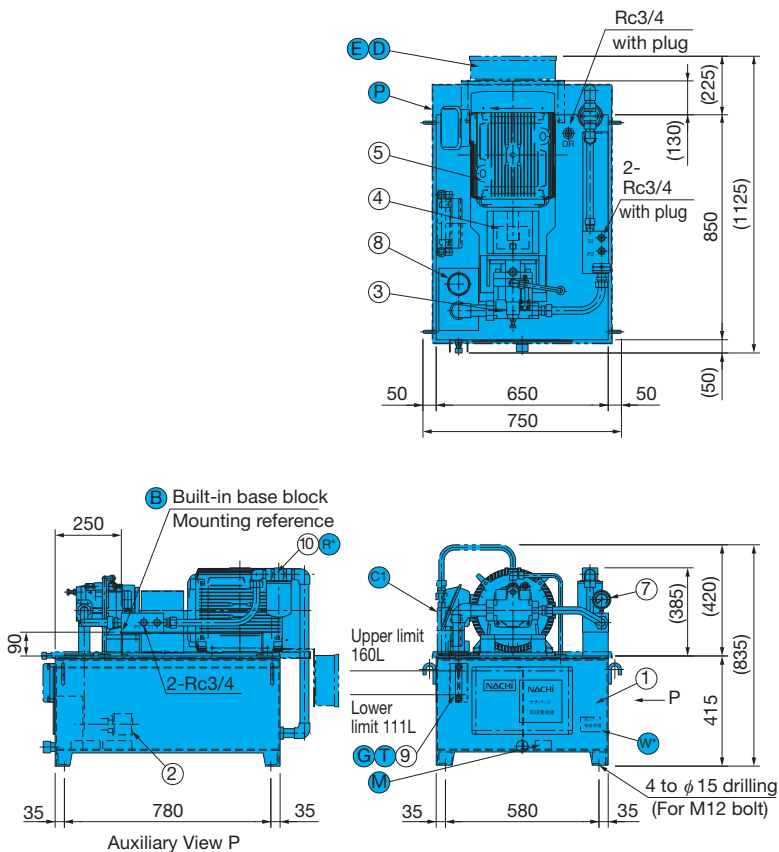


NCP-100-¹⁶PV₂₂N^{*}-(C1)R2-22



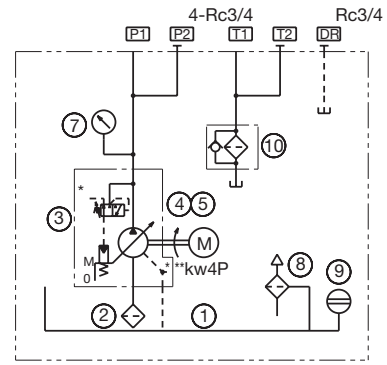
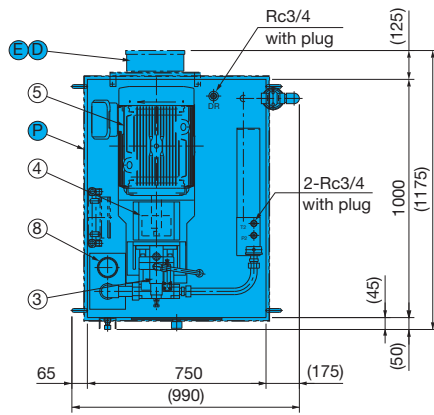
Part No.	Name	Model No.	Q'ty
1	Tank	100ℓ	1
2	Strainer	CS-06(150 mesh)	1
3	Pump	PVS-1A- ¹⁶ / ₂₂ N [*] -12	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan A terminal *kW-4P	1
6			
7	Pressure gauge	GV50-173x**MPA	1
8	Fluid supply port/air breather	MSA-V30	1
9	Fluid level gauge	φ6x80L	1
10	Return filter	FPL-06(10μ paper)	1
11	Fan cooler	3A92-001-0000	1

NCP-160-¹⁶PV35N^{*}-R^{*}-13

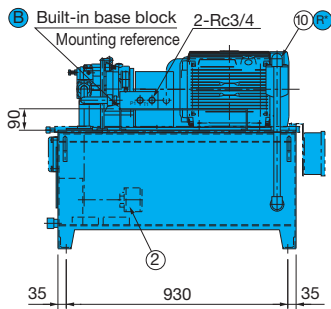


Part No.	Name	Model No.	Q'ty
1	Tank	160ℓ	1
2	Strainer	CS-10(150 mesh)	1
3	Pump	PVS-2A-35N [*] -12	1
4	Coupling	CR-****J	1
5	Motor	Fully closed external fan A terminal *kW-4P	1
6			
7	Pressure gauge	GV50-173x**MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	φ8x120L	1
10	Return filter	(FPL-08)CF-08 10μ paper	1

NCP-250-³⁵**PV₄₅N*-R*-13



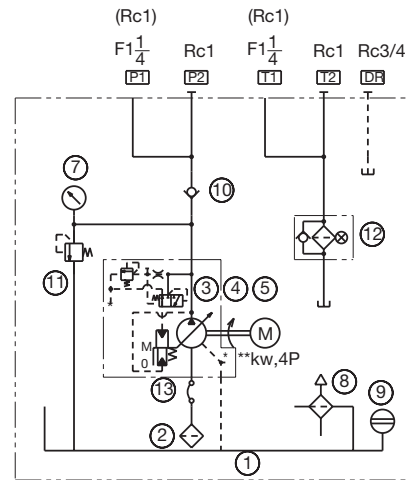
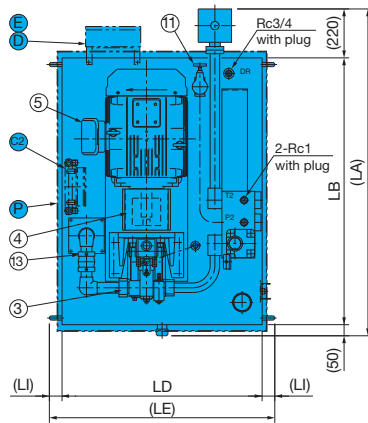
Part No.	Name	Model No.	Q'ty
1	Tank	250ℓ	1
2	Strainer	CS-10(150 mesh)	1
3	Pump	PVS-2A- ^{**} N*-12	1
4	Coupling	CR- ^{***} J	1
5	Motor	Fully closed external fan A terminal ^{**} kw-4P	1
6			
7	Pressure gauge	GV50-173 ^{**} MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	φ8×120L	1
10	Return filter	FRS08-20P08T(20μ) (FPL-08)CF-08 10μ paper	1



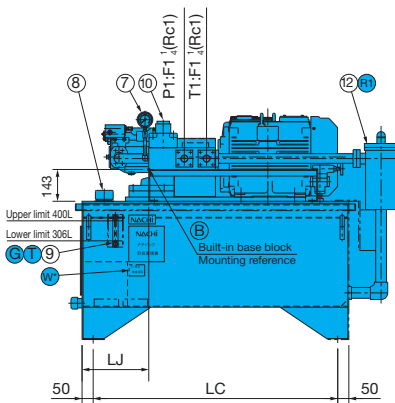
Auxiliary View P

NCP-400-^{**}PV70N*-R1*-13
NCP-650-^{**}PV70N*-R1*-13

Symbol	Dimensions (mm)	
	400ℓ	650ℓ
LA	1470	1790
LB	1200	1520
LC	1100	1420
LD	900	1010
LE	1014	1164
LF	800	910
LG	620	670
LH	1180	1230
LI	57	77
LJ	300	450



Part No.	Name	Model No.	Q'ty
1	Tank	^{**} ℓ	1
2	Strainer	CS-12(150 mesh)	1
3	Pump	PZS-3A-70N*-10	1
4	Coupling	CR- ^{***} J	1
5	Motor	Fully closed external fan A terminal ^{**} kw-4P	1
6			
7	Pressure gauge	GV50-173 ^{**} MPA	1
8	Fluid supply port/air breather	MSA-V50-VS10	1
9	Fluid level gauge	φ8×120L	1
10	Check valve	CA-G10-1-20	1
11	Relief valve	R-T03-3-12	1
12	Return filter	FRS12-20P-12F	1
13	Flexmaster joint	M1600-150-0350	1

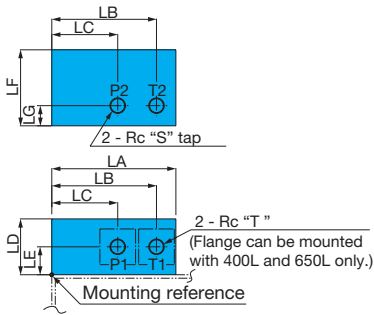


Auxiliary View P

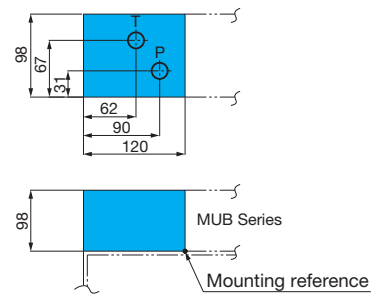
Note) Set (11) relief valve setting pressure so it is equivalent to pump setting pressure plus 1.0MPa {10.2kgf/cm²}.

Outlet Block Specifications

Design number 13
Outlet Block Dimensions

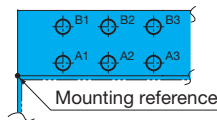


Design number 22
Outlet Block Dimensions



Tank Capacity	Dimensions (mm)							Outlet Size	
	LA	LB	LC	LD	LE	LF	LG	S	T
40L 60L 100L	160	135	85	72	36	98	26	1/2	1/2
160L 250L								3/4	3/4
400L 650L	300	260	160	98	49	148	48	1	JIS B 2291 SSA-32 (Rc)

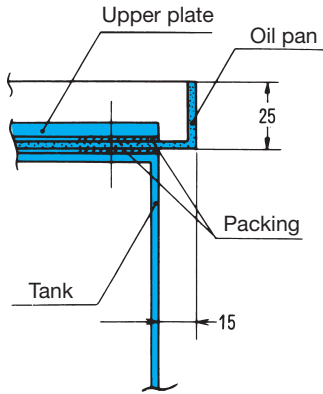
Option B
MPU Series Built-in
(See base block specifications for dimensions.)



Oil Pan Specifications

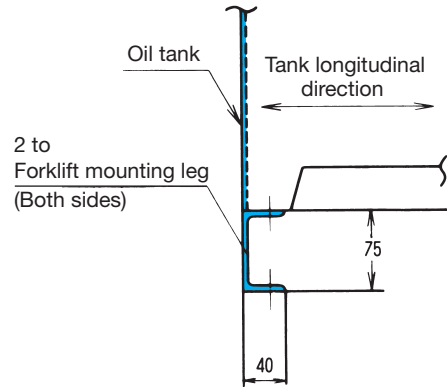
A "headband type" oil pan is standard, and an oil pan drain is provided at one location (Rc3/8).

Structural Diagram



Forklift Mounting Leg Specifications

Forklift Mounting Leg Specifications



Standard Specifications

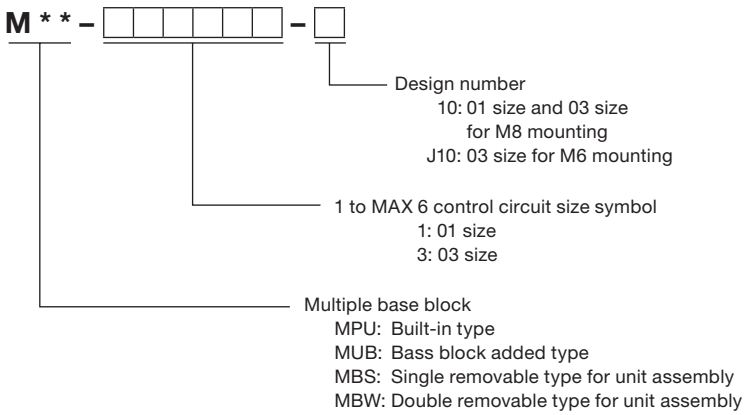
1. Paint Color: Mancel No. 5B6/3 (lacquer)

2. Motor Specifications:

		Wiring	Color Coding	Terminal number	Terminal	Terminal box specifications
Control System	SA SS	VCT-1.25mm ²	Single SOL White, Black Double SOL Red, White, Black, Green	1, 2, ... Consecutive numbers (Common: C)	Y Type Solderless	Inner : Mancel No. 2.5Y8/2 Dust-tight type, cover fastened by screws Outer : Mancel No 5B6/3 (Lacquer)
Drive System	to 3.7kW 5.5kW to	VCT IV + PF	Red, White, Black, Green Black (3) + Green	U, V, W, E	Round Solderless	
Fan cooler	3A92	VCT-1.25mm ²	White, Black	U2, V2	Round Solderless	

Base Block Specifications

Explanation of model No.

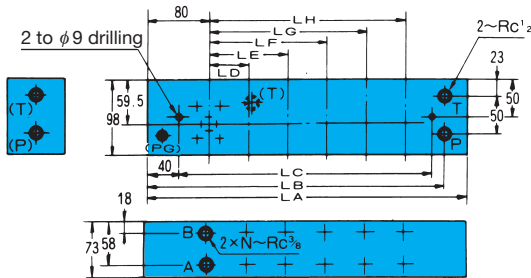


● MPU Series (Unit Built-in)

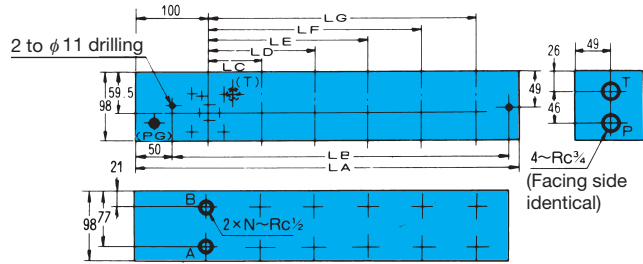
This base block is a special type built into the NCP Series.

Block Model Numbers, Appearance, Dimensions

01 size



03 size



Model No.	Dimensions (mm)									Weight kg
	LA	LB	LC	LD	LE	LF	LG	LH	N	
MPU -1-10	160	130	75						1	8.3
-11-10	210	180	125	50					2	10.9
-111-10	260	230	175	50	100				3	13.4
-1111-10	310	280	225	50	100	150			4	16.0
-11111-10	360	330	275	50	100	150	200		5	18.6
-111111-10	410	380	325	50	100	150	200	250	6	21.2

Model No.	Dimensions (mm)									Weight kg
	LA	LB	LC	LD	LE	LF	LG	N		
MPU -3-J10(10)	160	95							1	11.1
-33-J10(10)	235	170	75						2	16.3
-333-J10(10)	310	245	75	150					3	21.5
-3333-J10(10)	385	320	75	150	225				4	26.7
-33333-J10(10)	460	395	75	150	225	300			5	31.9
-333333-J10(10)	535	470	75	150	225	300	375		6	37.0

Note) 1. There are two types of mounting bolts available for the 03 size: M6 and M8. Be sure to specify the type of bolt you need.

M6 : SA, SS-J Series
M8 : SS Series

2. When using the 01/03 combination type

a) The installation pitch uses the 03 size dimensions shown above, and for A and B ports only the 01 size installation part is Rc3/8.

b) In the case of MPU-313131-J10, for example, valve installation locations 1, 3, and 5 counting from the left are 03 size, while 2, 4, 6 are 01 size.

Other

Space is limited in accordance with tank capacity, so use the basic data in the following table when designing the circuit.

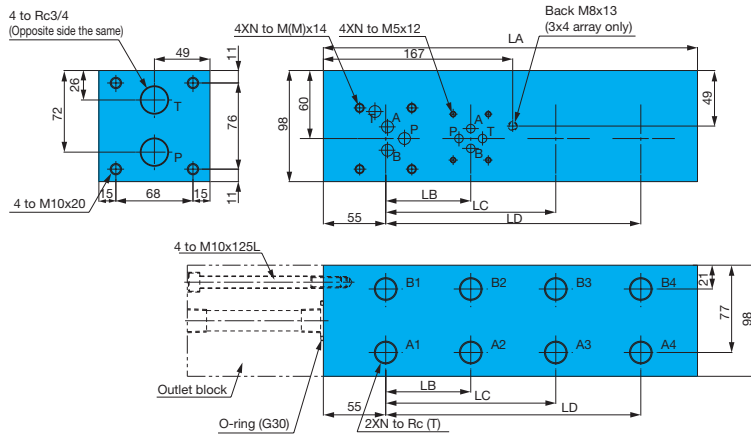
	Tank Capacity	01 Space Block	03 Space Block	
VD Series	40ℓ	Up to 4	Up to 3	
	60ℓ	Up to 5	Up to 3	
	100ℓ	Up to 6	Up to 5	
	160ℓ	Up to 6	Up to 5	
	250ℓ	Up to 6	Up to 6	
	400, 650ℓ		Up to (2, 4, 6) + Up to (3, 2, 1)	
PVS Series	30ℓ	Up to 3		
	40ℓ	Up to 4	Up to 3	
	60ℓ		Up to 5	Up to 3
		Z	Up to 6	Up to 4
	100ℓ	Up to 6	Up to 4	
	160, 250ℓ	Up to 6	Up to 4	
400, 650ℓ		Up to (2, 4, 6) + Up to (3, 2, 1)		

Note) Note that using in series larger than those noted above causes overhang from the top plate.

●MUB Series (Base Block Additional Configurations)

This series makes it easy to add an option base block using only four mounting bolts. The following shows the range of the possible addition. In this configuration, the NCP unit design number becomes 22.

Block Model Numbers, Appearance, Dimensions



Model No.	Dimensions (mm)							Weight kg
	LA	LB	LC	LD	N	M	T	
MUB-1-10	105				1	—	3/8	7.6
MUB-3-J10(10)	105				1	6(8)	1/2	7.6
MUB-11-10	180	75			2	—	3/8	12.8
MUB-33-J10(10)	180	75			2	6(8)	1/2	12.8
MUB-111-10	255	75	150		3	—	3/8	18.0
MUB-333-J10(10)	255	75	150		3	6(8)	1/2	18.0
MUB-1111-10	330	75	150	225	4	—	3/8	23.2
MUB-3333-J10(10)	330	75	150	225	4	6(8)	1/2	23.2

Note) 1. There are two types of mounting bolts available for the 03 size: M6 and M8. Be sure to specify the type of bolt you need.

M6 : SA, SS-J Series
M8 : SS Series

2. When using the 01/03 combination type

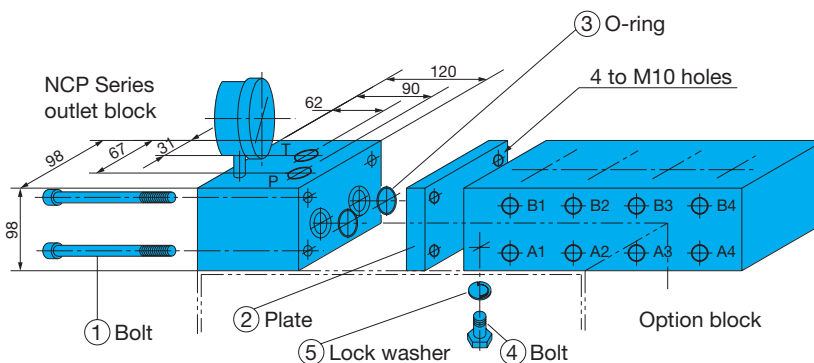
- a)The installation pitch uses the 03 size dimensions shown above, and for A and B ports only the 01 size installation part is Rc3/8.
- b)In the case of MUB-3131-J10, for example, valve installation locations 1 and 3 counting from the left are 03 size, while 2, 4 are 01 size.

3. When using a 2-speed plate, a special MUB type is used. Contact your agent for more information.

Option Base Block Installation Procedure

Loosen bolts ① and ④ and remove plate ②. Next, after checking to ensure that O-ring ③ is installed, install the option base block using ①, ④, and ⑤.

Note) ④ and ⑤ are used only in 3 and 4 multi configurations. In single and double configurations, ④ and ⑤ are just removed.

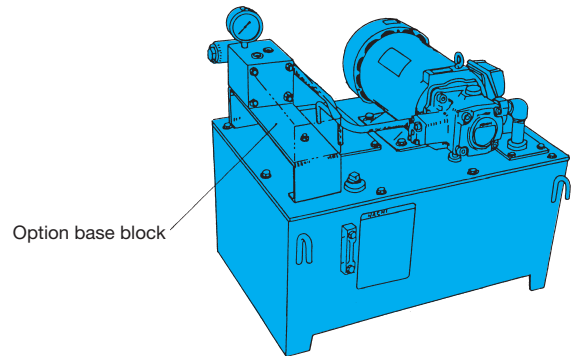


22 Design Series Scope

This series consists of a total of six best-seller piston and vane types with 40, 60, and 100ℓ tanks. Note that piston Z type and vane VC type are not included.

Option Base Block Addition Scope

Tank Capacity	01 Base Block	03 Base Block
40ℓ	Up to 2	Up to 2
60ℓ	Up to 3	Up to 3
100ℓ	Up to 4	Up to 4

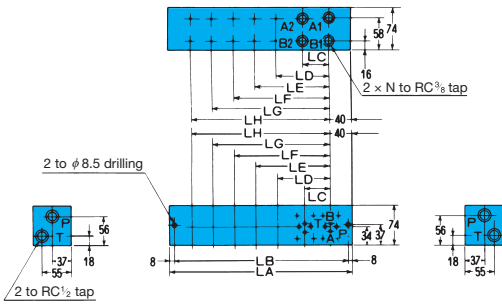


Part No.	Name	Model No.
1	Hexagon Socket Head Bolt	M10 x 125
2	Plate	98 x 98 x 15t
3	O-ring	1B-G30
4	Hex bolt	M8 x 25
5	Lock washer	For M8

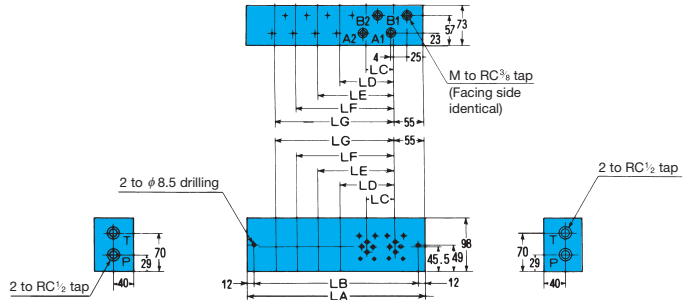
●MBS, MBW Series (Unit Assembly Type)

This base block is used to install the valve unit only around machinery.

Block Model Numbers, Appearance, Dimensions
MBS Series (Single Ejection Multi Block)
01 size



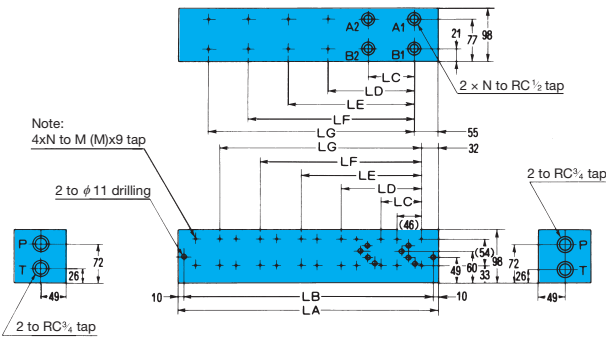
MBW Series (Double Ejection Multi Block)
01 size



Model No.	Dimensions (mm)								Weight kg	
	LA	LB	LC	LD	LE	LF	LG	N		
MBS -1-10	80	64						1	3.4	
-11-10	130	114	50					2	5.5	
-111-10	180	164	50	100				3	7.6	
-1111-10	230	214	50	100	150			4	9.8	
-11111-10	280	264	50	100	150	200		5	11.9	
-111111-10	330	314	50	100	150	200	250	6	14	
-1111111-10	380	364	50	100	150	200	250	300	7	16

Model No.	Dimensions (mm)								Weight kg	
	LA	LB	LC	LD	LE	LF	LG	M		
MBW -1-10	110	86						2x2	1	5.7
-11-10	160	136	50					4x2	2	8.3
-111-10	210	186	50	100				6x2	3	10.9
-1111-10	260	236	50	100	150			8x2	4	13.4
-11111-10	310	286	50	100	150	200		10x2	5	16
-111111-10	360	336	50	100	150	200	250	12x2	6	18.6

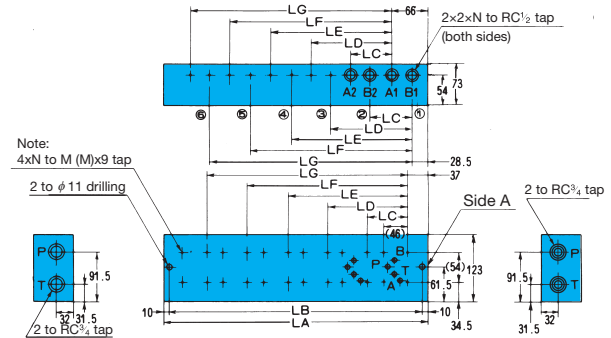
03 Size (01, 03 Connection Type)



Model No.	Dimensions (mm)								Weight kg	
	LA	LB	LC	LD	LE	LF	LG	M ^{Note 1)}		
MBS-3 ~J10(10)	110	90						6(8)	1	8.2
-**~J10(10)	185	165	75					6(8)	2	13.8
-***~J10(10)	260	240	75	150				6(8)	3	19.4
-****~J10(10)	335	315	75	150	225			6(8)	4	25.0
-*****~J10(10)	410	390	75	150	225	300		6(8)	5	30.7
-*****~J10(10)	485	465	75	150	225	300	375	6(8)	6	36.3

- Note) 1. There are two types of mounting bolts available for the 03 size: M6 and M8. Be sure to specify the type of bolt you need.
M6 : SA, SS-J Series
M8 : SS Series
2. When using the 01/03 combination type
a)The installation pitch uses the 03 size dimensions shown above, and for A and B ports only the 01 size installation part is Rc3/8.
b)In the case of MBS-313131-J10, for example, valve installation locations 1, 3, 5 counting from the right are 03 size, while 2, 4, 6 are 01 size.

03 Size (01, 03 Connection Type)

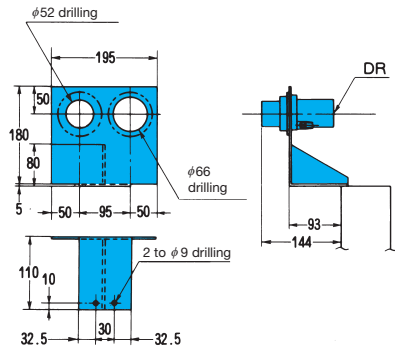


Model No.	Dimensions (mm)								Weight kg	
	LA	LB	LC	LD	LE	LF	LG	M ^{Note 1)}		
MBW-3 ~J10(10)	120	100						6(8)	1	8.4
-**~J10(10)	195	175	75					6(8)	2	13.6
-***~J10(10)	270	250	75	150				6(8)	3	18.9
-****~J10(10)	345	325	75	150	225			6(8)	4	24.1
-*****~J10(10)	420	400	75	150	225	300		6(8)	5	29.4
-*****~J10(10)	495	475	75	150	225	300	375	6(8)	6	34.6

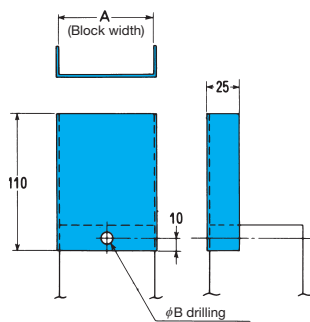
- Note) 1. There are two types of mounting bolts available for the 03 size: M6 and M8. Be sure to specify the type of bolt you need.
M6 : SA, SS-J Series
M8 : SS Series
2. When using the 01/03 combination type
a)The installation pitch uses the 03 size dimensions shown above, and for A and B ports only the 01 size installation part is Rc3/8.
b)In the case of MBS-313131-J10, for example, valve installation locations 1, 3, and 5 counting from the right are 03 size, while 2, 4, 6 are 01 size.

Control Circuit Option Specifications

Option G (Pressure Gauge Panel Dimension Diagram)



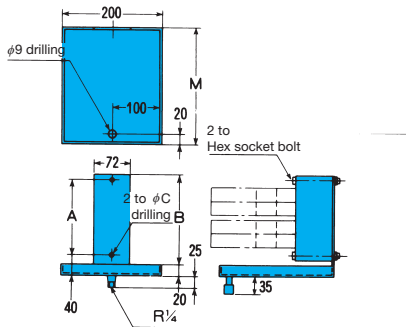
Option N (Nameplate Panel Dimension Diagram)



Model No.	A	B
MBS-01	74	9
MBS-03	98	11
MBW-01	98	9
MBW-03	123	11

Note) The nameplate panel is separate from the base block when shipped, so fasten them together during installation.

Option P (Oil Pan Dimension Diagram)



Number of Modules	M	
	For 01	For 03
0	145	165
1	185	225
2	225	265
3	265	330
4	305	385

Note) When shipped, the oil pan is fastened from the back by the same nut as the block.

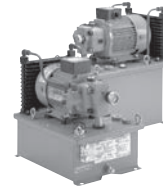
Option P Dimension Table

Model No.	A	B	C	Applicable
P-S1-1	64	92	9	MBS-1
-2	114	142	9	11
-3	164	192	9	111
-4	214	242	9	1111
-5	264	292	9	11111
-6	314	342	9	111111
-7	364	392	9	1111111

Model No.	A	B	C	Applicable
P-W1-1	86	118	9	MBW-1
-2	136	168	9	11
-3	186	218	9	111
-4	236	268	9	1111
-5	286	318	9	11111
-6	336	368	9	111111

Model No.	A	B	C	Applicable
P-S3-1	90	120	11	MBS-3
-2	165	195	11	33
-3	240	270	11	333
-4	315	345	11	3333
-5	390	420	11	33333
-6	465	495	11	333333

Model No.	A	B	C	Applicable
P-W3-1	100	130	11	MBW-3
-2	175	205	11	33
-3	250	280	11	333
-4	325	335	11	3333
-5	400	430	11	33333
-6	475	505	11	333333



NSP Series Compact Variable Pump Unit

Compact hydraulic units are widely used as a power source in such machine tool applications as NC lathe check opening and closing, tool rotation, machining center spindle raise and lower operations, etc.

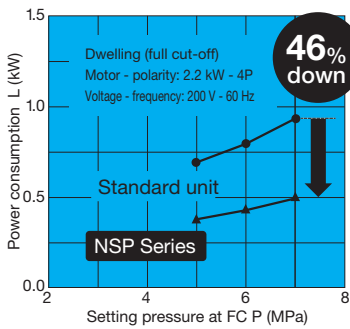
During pressure holding, the NSP unit enables high machine efficiency that delivers energy savings of approximately 46% compared

to standard Nachi units (in-house comparison), all in a compact, lightweight hydraulic unit.

Features

Increased energy savings

Support for using an efficient IE3 premium motor provides 46% energy savings compared to standard unit (in-house comparison while dwelling)



Space-saving

Variable vane pump has integrated motor so installations in compact spaces are easy in a compact and streamlined layout.

Conserve Resources

Hydraulic fluid in a low-volume tank helps conserve the world's resources.

Easy Operation and Maintenance

Simple construction and highly reliable pump controls mean excellent maintenance and handling.

Compliant with UL and EISA in the US

Lineup of models use UL certified electric motors and comply with the US Energy Independence and Security Act.

High Efficiency for Low Heat Output

Motor efficiency is high and heat output is low, particularly when the pump is dwelling, to support high accuracy for the parent machine.

Specifications

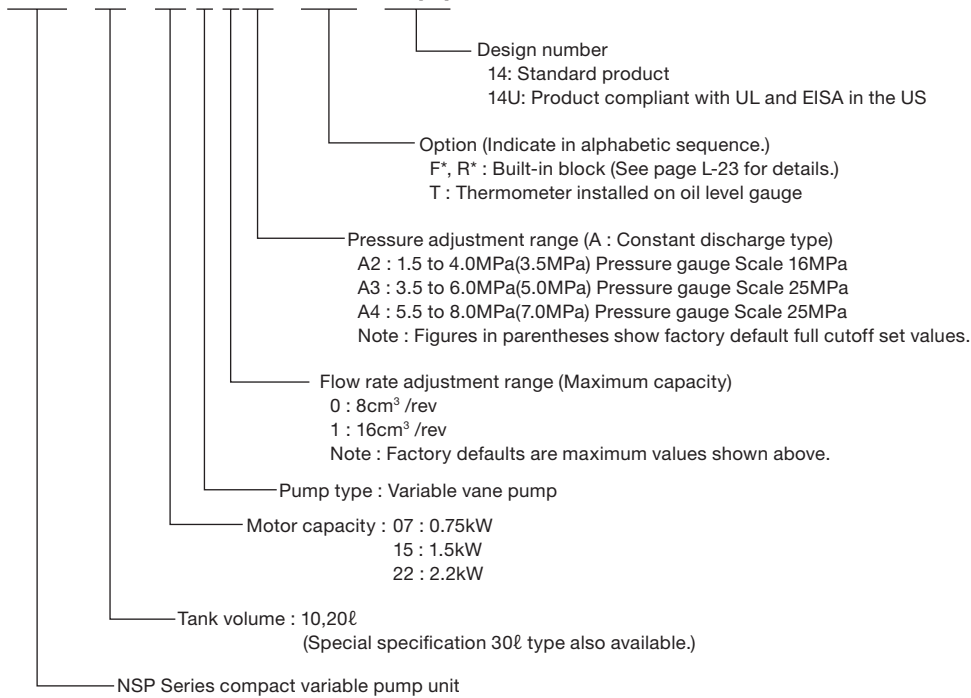
Item	Model No.	NSP-*-VOA*	NSP-*-V1A*	NSP-*-V2A*
Pump Capacity	cm ³ /rev	8.0	16.0	26.0
Maximum Pressure	MPa	8.0 (81.6kgf/cm ²) (Full Cutoff Pressure)		7.0 (Full Cutoff Pressure) * Allowed peak pressure is 13.0
Motor Output	kW	0.75, 1.5	1.5, 2.2	2.2, 3.7
Tank Capacity	ℓ	10, 20		30, 40
Installation Space	mm	300 × 400		340 × 450
Approximate Weight	kg	39 (10ℓ, 1.5kW, excluding options)		81 (30ℓ, 2.2kW, excluding options)

Explanation of model No.

Note) 1.Note that there are certain restrictions on pump capacity and motor capacity combinations. See the Selection Precautions on page L-23 before selecting a model.
2.Design numbers are subject to change without notice.

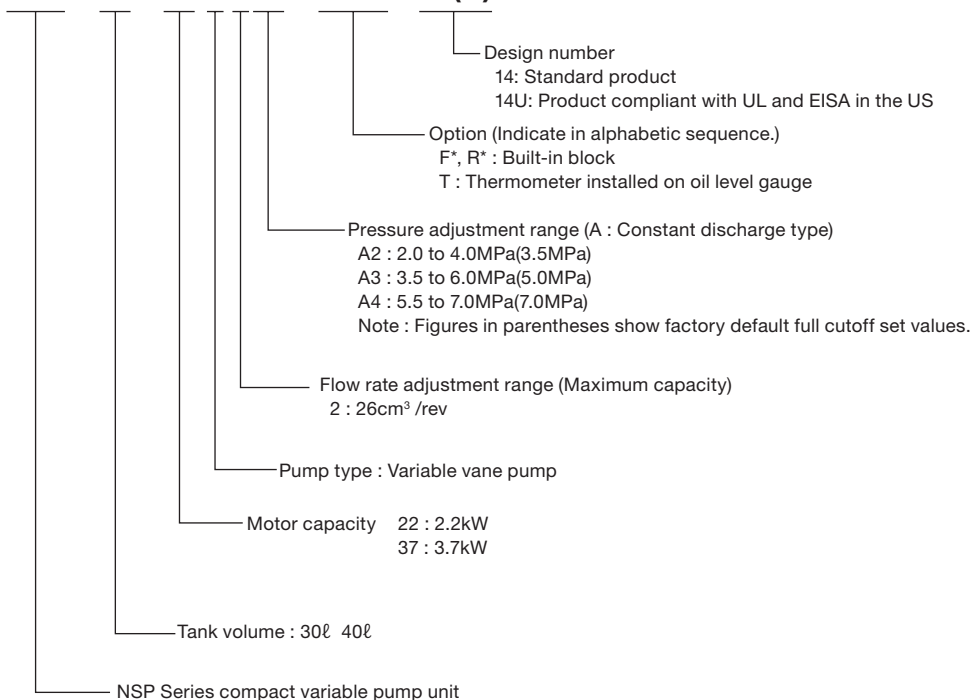
8.0, 16.0cm³/rev Series

NSP-10-07V0A2-F2T-14(U)



26.0cm³/rev Series

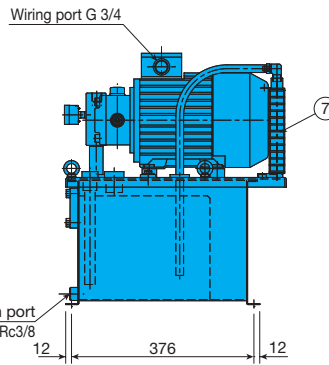
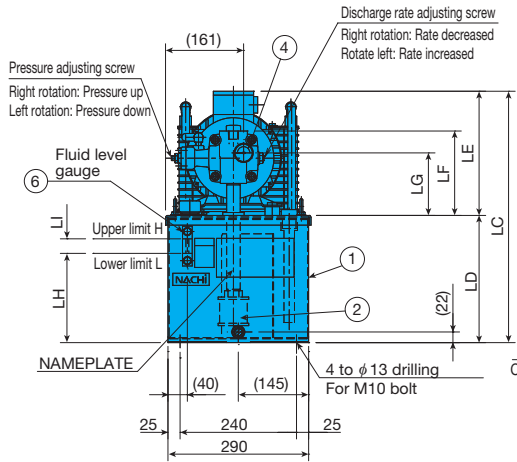
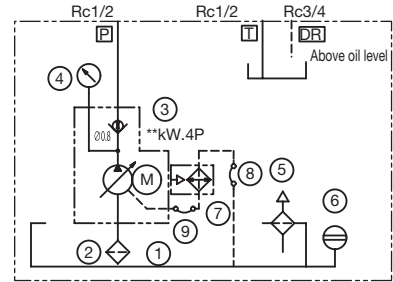
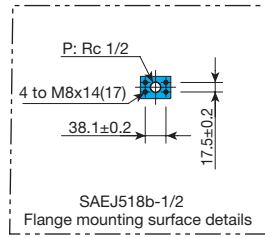
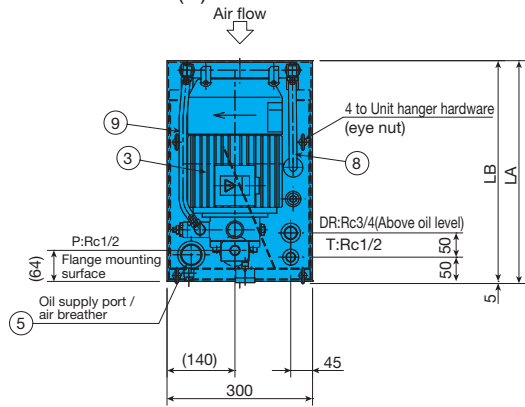
NSP-30-22V2A2-F22T-14(U)



Design Drawings, Dimension Tables

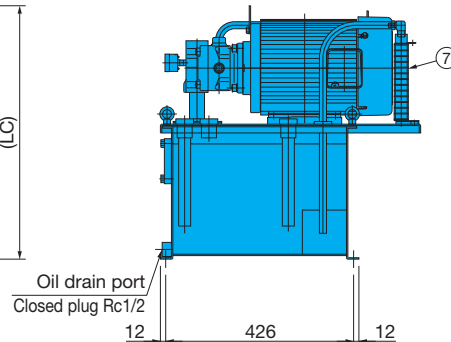
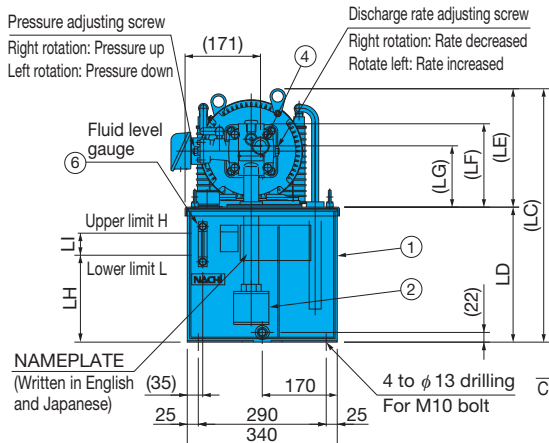
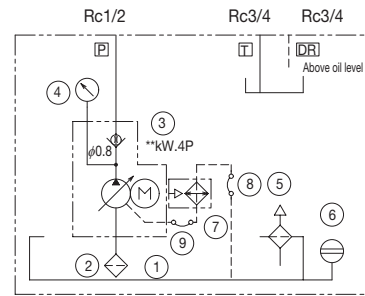
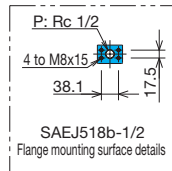
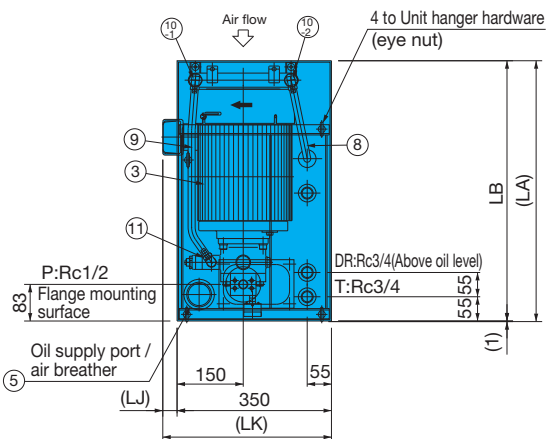
Note: See the following page for dimensions.

8.0, 16.0cm³/rev Series NSP-**-**V*A*-14(U)



Part No.	Part Name
1	Oil tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Radiator
8	Flexible hose
9	Flexible hose

26.0cm³/rev Series NSP-**-**V2A*-14(U)



Part No.	Part Name
1	Oil tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Radiator
8	Flexible hose
9	Flexible hose

8.0, 16.0cm³/rev Series

Model No.	Motor (kW-P)	Dimensions											Approximate Weight (kg)
		LA	LB	LC	LD	LE	LF	LG	LH	LI	H	L	
NSP-10-07V*A*-14(U)	0.75-4	405	400	394	160	234	154	109	102	10	10L	9L	35
NSP-10-15V*A*-14(U)	1.5-4	430	425	396		236	164	119					39
NSP-10-22V*A*-14(U)	2.2-4	460	455	422		256	174	129					46
NSP-20-07V*A*-14(U)	0.75-4	405	400	496	262	234	154	109	185	30	20L	17L	37
NSP-20-15V*A*-14(U)	1.5-4	430	425	498		236	164	119					41
NSP-20-22V*A*-14(U)	2.2-4	460	455	518		256	174	129					48

(Excluding operating fluid)

26.0cm³/rev Series

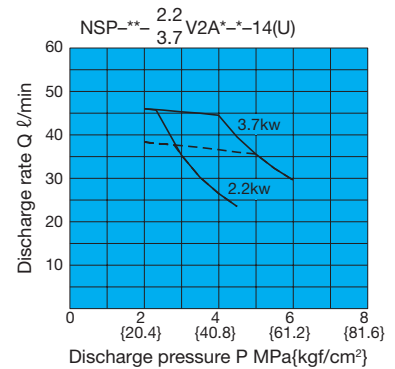
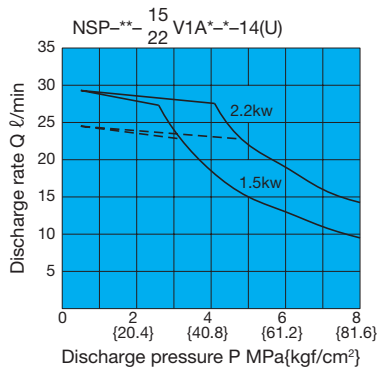
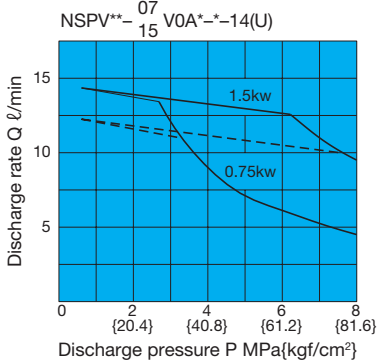
Model No.	Motor (kW-P)	Dimensions												Approximate Weight (kg)	
		LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	H		L
NSP-30-22V2A*-14(U)	2.2-4	566	565	547	306	241	177	127	197	50	3	353	30L	23L	80
NSP-30-37V2A*-14(U)	3.7-4	591	590	574		268	189	139			32	382			86
NSP-40-22V2A*-14(U)	2.2-4	566	565	626	385	241	177	127	256	70	3	353	40L	31L	84
NSP-40-37V2A*-14(U)	3.7-4	591	590	653		268	189	139			32	382			90

(Excluding operating fluid)

Selecting a Motor

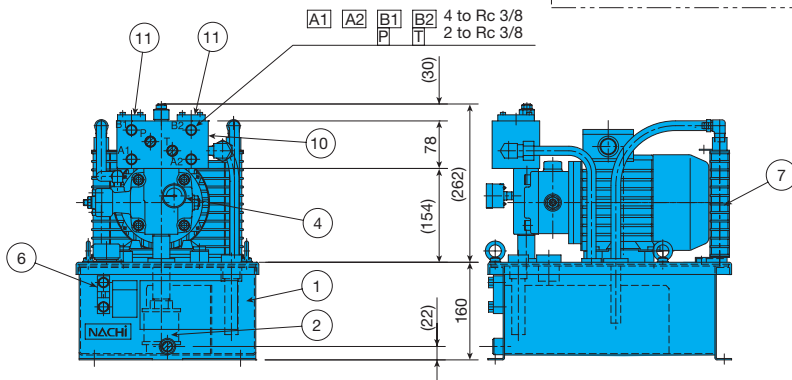
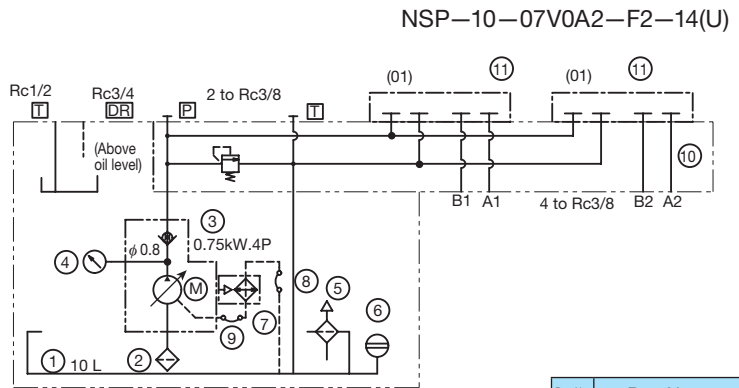
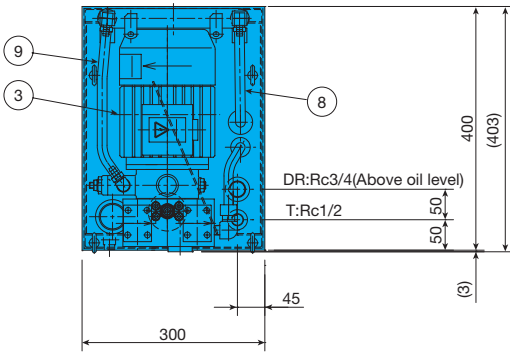
NSP Motor Selection Curves (Standard voltage for drive motor is 200 VAC, 50/60 Hz or 220 VAC, 60 Hz.)

--- 50Hz — 60Hz



* See page B-43 for the characteristics of the drive motor.

[Block Addition Example]
NSP-10-07V0 A2-F2-14(U)

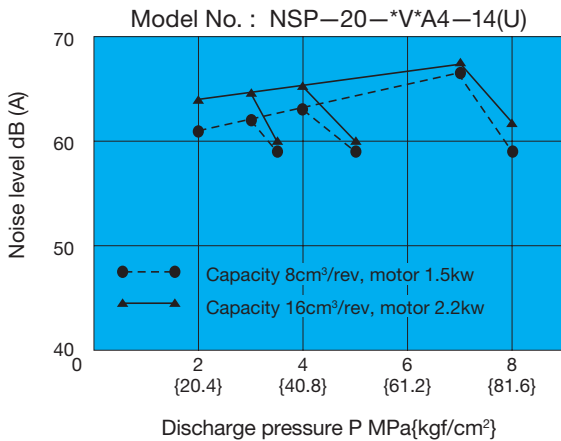


Part No.	Part Name
1	Oil tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Radiator
8	Flexible hose
9	Flexible hose
☆ 10	Base Blocks
☆ 11	End Plates

☆: Part numbers 10 and 11 are options. Part number 11 is standard when a block is equipped.

Performance Characteristics

① Noise Characteristics

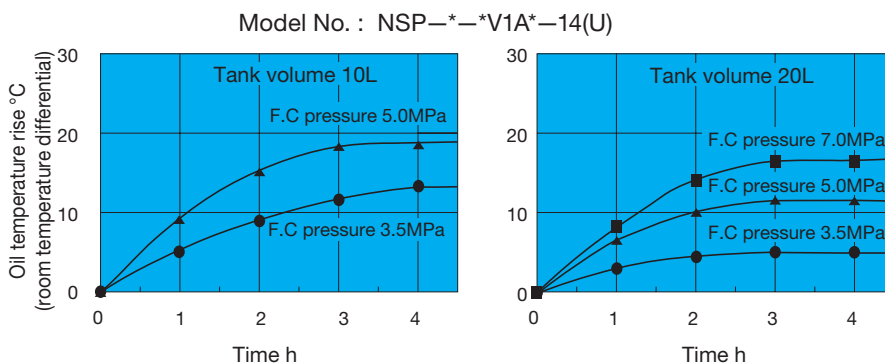


Conditions

(The values shown in the graph to the left are typical characteristics under the following conditions.)
Operating Fluid: ISO VG32 equivalent
Oil Temperature: $40 \pm 5^\circ\text{C}$
Revolution Speed: 1800 min^{-1}
Measurement Distance:
1 meter around the unit
(Average value from four directions)

Note) Noise characteristics are affected by the condition of the floor and stand where the unit is mounted, whether there are noise reflective items nearby, and other factors. Such factors can produce different characteristics than those indicated above.

② Oil Temperature Characteristics



Conditions

(The values shown in the graph to the left are typical characteristics under the following conditions.)
Operating Fluid: ISO VG32 equivalent
Revolution Speed: 1800 min^{-1}
Room Temperature: 29°C
Motor: 0.75 to 2.2kW

Note) 1. Note that continuous operation at pressures of 5.0MPa or greater with the 10L tank cause a large rise in oil temperature. A 20L tank is recommended in this case.
2. Rises in oil temperature depend on actual operating conditions, and so actual temperatures may be different from those indicated above.

Note) For information about power consumption, see the data for the UVN Series variable vane uni-pump on page B-43.

Selection Precautions

Model Combinations

- 1 The table below shows the standard pump and motor combinations.

Pump	Motor kW	0.75	1.5	2.2	3.7
0A*		○	○		
1A*			○	○	
2A2				○	○
2A3				○	○
2A4					○

- 2 A 30L tank capacities with 8.0 or 16.0 cm³/rev are special specifications.
 3 A model equipped with a block comes with a stopper plate on the block.

Circuit Configuration

- 1 The basic configuration is a standard NSP-** plus an external manifold (circuit).
 2 Provide piping with sufficient flexibility between the unit and external manifold.

- Make sure the maximum peak pressure (setting pressure + surge pressure) during operation does not exceed 14MPa.

The following are typical pipe conditions at a reference maximum peak pressure at 14MPa or less as reference. Rubber hose (for 14MPa) 1/2" x 2m (Pipe Capacity: 250cm³) pump operating conditions: 1MPa→7MPa, full cutoff

- At pressures in excess of 14MPa, equip a circuit side surge cutoff relief valve.

Note) The maximum peak pressure of a pump capacity of 26 cm³/rev is 13 MPa.

Built-in Manifold Block

- 1 When a manifold block (optional) is built into the pump, make sure the

block and valve total weight is not greater than 15kg.

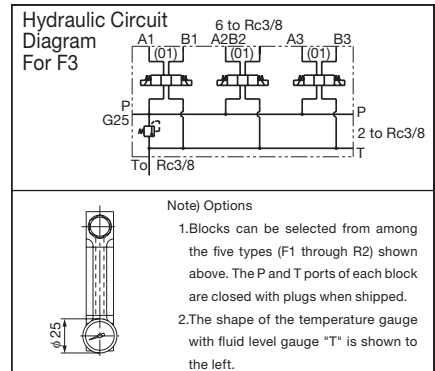
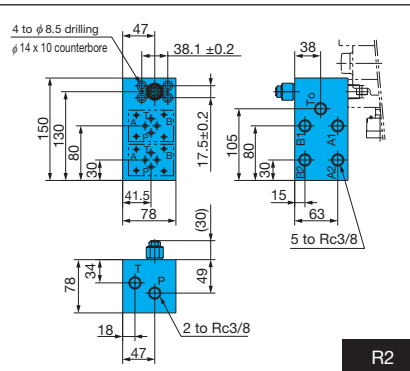
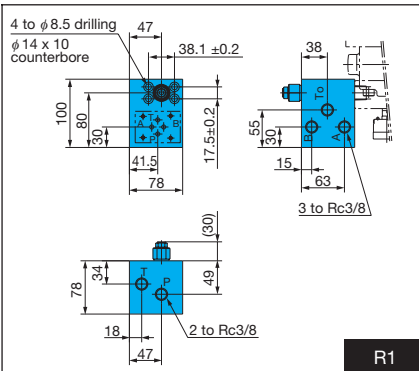
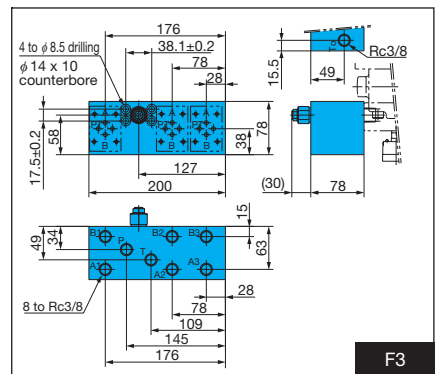
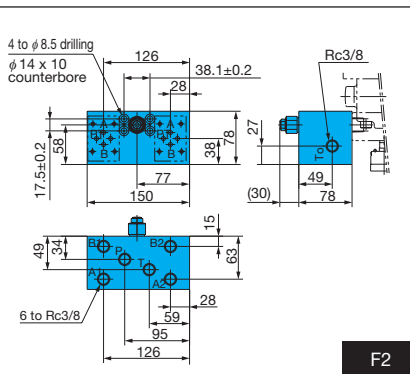
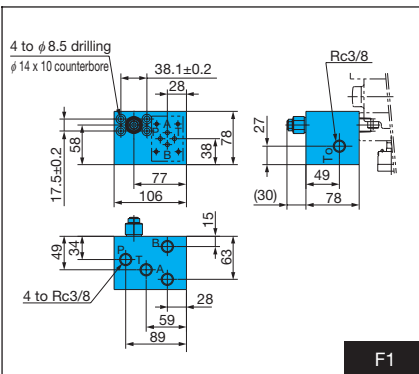
Block Type	F1-R1	F2-R2	F3
Block Weight (kg)	4.5	6.5	8.5
Allowable Additional Weight (kg)	10.5	8.5	6.5

- 2 Contact your agent for information about equipping a circuit.
 3 The 26 cm³/rev series blocks are different, contact us for information.

Paint Specifications

- 1 The interior and exterior of the tank are coated with a melamine baked-on resin coating, the motor is coated with cation electrodeposition coating, while the pump is spray painted with a lacquer finish. Color is Nachi standard color (Munsell No.N-1 70% gloss).
 2 Contact your agent about specifying external paint colors.

Option Details



Handling Overview

Startup Precautions

- 1 Check to make sure that the operating fluid in the tank is at the prescribed level.

A Upper Limit Mark (Yellow): Prescribed fluid level (nominal capacity)

B Lower Limit Mark (Red): Minimum fluid level

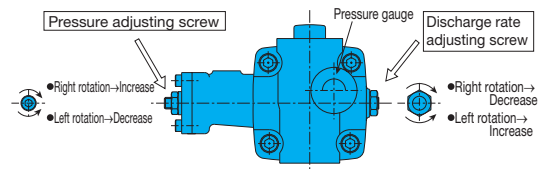
Hydraulic Operating Fluid: General oil-based operating fluid equivalent to ISO VG32

- 2 Perform electrical wiring exactly as shown below.

Motor and Power Supply Polarity R→U S→V T→W	⇒ If wiring is performed incorrectly... · Electric pump rotates in reverse, fluid is not discharged. Continued operation can damage the pump. · Attach a pressure gauge to the discharge side and check for pressure rise.
--	---

- 3 Perform repeated motor starts and stops to bleed air from the interior of the pump and the suction piping. A no-load circuit allows faster bleeding.

Adjusting the Pressure and Discharge



Note: Do not touch anything except the adjustment screw shown above.

Maintenance and Inspection

- 1 Oil Temperature: Use in an area where the temperature is 15°C to 60°C.
 2 Operating Fluid Replacement Cycle: Perform the initial fluid replacement after three months of operation. After that, replace fluid when it becomes dirty or once a year, whichever comes first.
 3 Radiator Fin Cleaning and Fin Strainer Cleaning: Every six months or 4,000 hours of operation, whichever comes first.
 Environment
 1 Temperature: 10 to 35°C
 2 Avoid areas exposed to mist of water-soluble coolant.



Inverter Drive NSP Series Energy-saving Variable Pump Unit with Inverter Drive

The "Inverter Drive NSP Series" is a hydraulic unit that reduces energy consumption by approximately 69% (dwelling, in-house comparison) compared to the standard unit by adding an energy saving NSP Series inverter drive.

They are great for jobs that need to dwell for long periods.

Features

Hydraulic oil temperature is kept at room temperature +1.5°C

The NSP series benefits your entire system by lowering oil temperature to improve machining accuracy, lengthen the life of seals and hydraulic fluid, and reduce factory air conditioning costs.

- NSP-20E-22V1A4-15
- 6.0MPa maintained while dwelling

Operates with the inverter removed also

- Can operate as an NSP unit just by switching out the wiring in case of emergencies.
- The suspension of production lines will be minimized even if there is trouble with the inverter because it is based on our reliable NSP unit and keeps running as a regular NSP unit.

Quiet operation at only 53dB (A)

- NSP-20E-22V1A4-15
- 6.0MPa dwelling
- 4-directional average
Standard unit sound level is 64dB (A)

Easy Operation

- Starts up as soon as the power is turned on
- Absolutely no external commands or delicate electrical adjustments needed because the pump's RPMs are controlled automatically in response to the load.

Inverter drive function can be installed separately later

- If you are already using an NSP unit, you can add the inverter drive function by installing the inverter control box kit, which is sold separately.

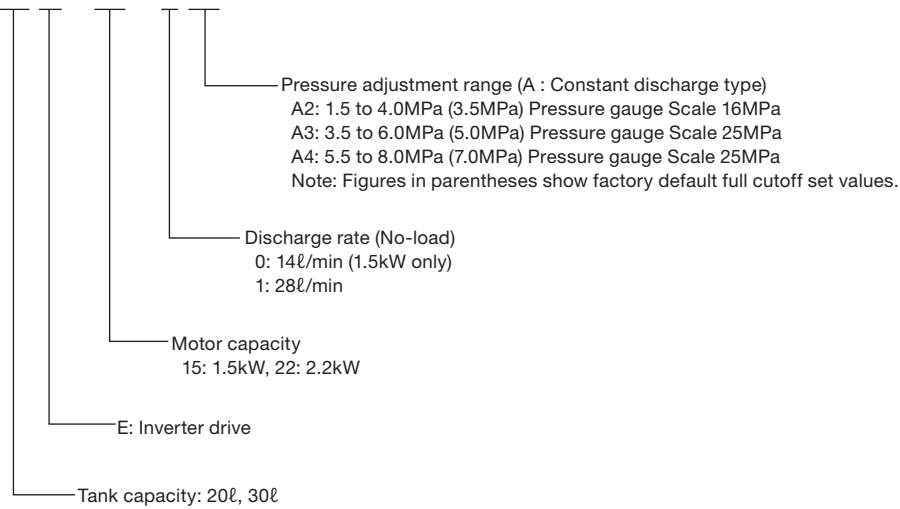
Specifications

1. Power Supply Rated Input Current	3 ϕ AC200 to 220V, 50/60Hz 9.7A/1.5kW, 13.4A/2.2kW 22.4A/3.7kW	
2. Pressure Adjustment Range	8, 16cm ³ /rev series A2: 1.5 to 4.0MPa A3: 3.5 to 6.0MPa A4: 5.5 to 8.0MPa	26cm ³ /rev series A2: 2.0 to 4.0MPa A3: 3.5 to 6.0MPa A4: 5.5 to 7.0MPa
3. Output Flow (at No-load)	0A*: 14 ℓ /min, 1A*: 28 ℓ /min 2A*: 46 ℓ /min	
4. Hydraulic Fluid	Standard mineral-based hydraulic fluid (equivalent to ISO VG32)	
5. Hydraulic Oil Temperature	10 to 60°C	
6. Color of Paint	Munsell No.N-1 70% gloss	
7. Ambient Temperature/ Humidity	0 to 35°C/ 20 to 85%RH (non-condensation) (Keep the unit away from water-soluble cutting fluid mist.)	

Explanation of model No.

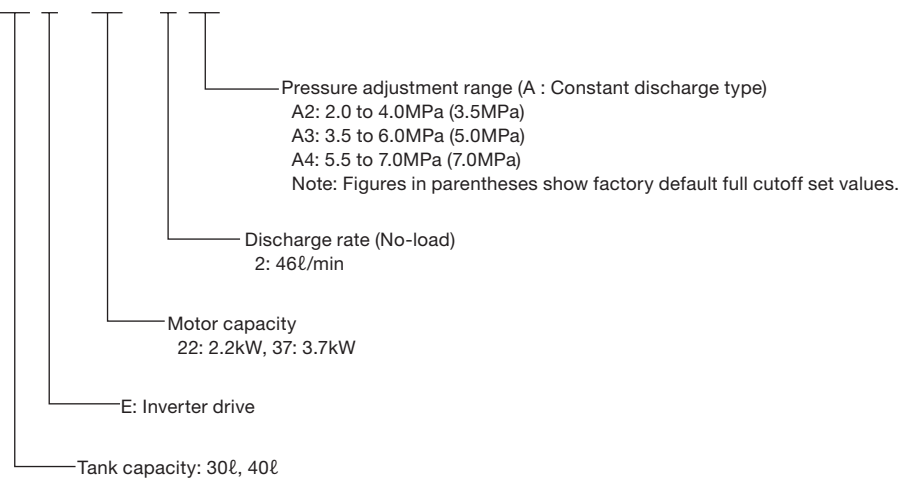
8.0, 16.0cm³/rev Series

NSP - 20 E - 15 V 0 A2 - 15



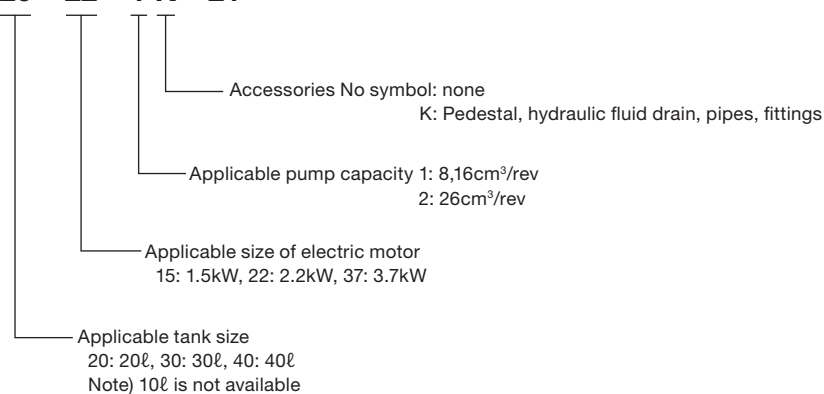
26.0cm³/rev Series

NSP - 30 E - 22 V 2 A2 - 15



Inverter Control Box Kit Specifications

EBK - 20 - 22 - 1 K - 21

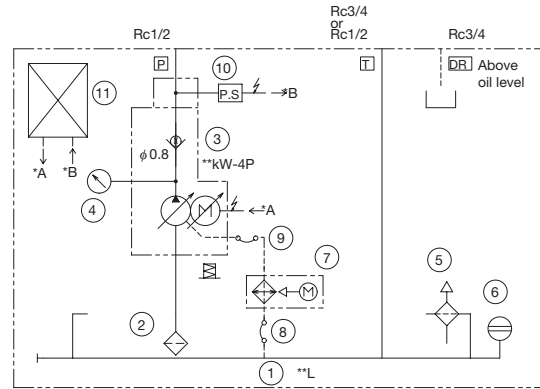
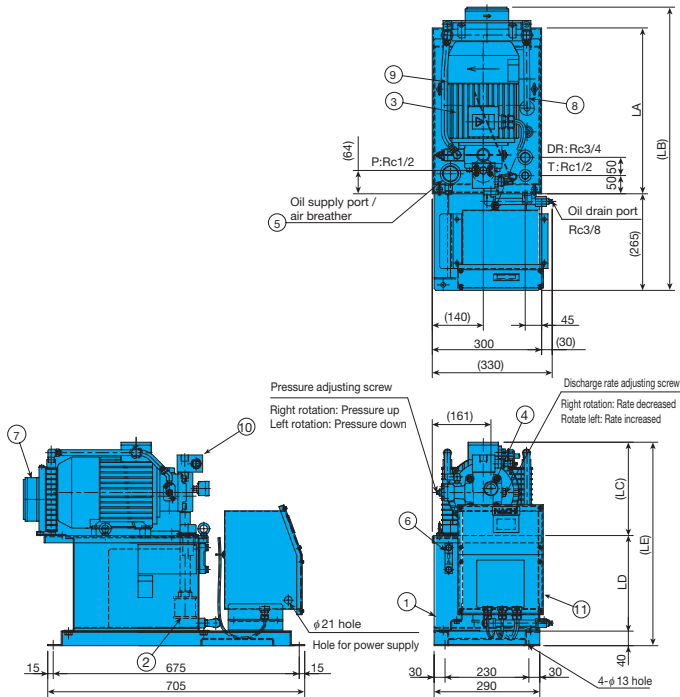


Design Drawings, Dimension Tables

Note) See the following page for dimensions.

8.0, 16.0cm³/rev Series

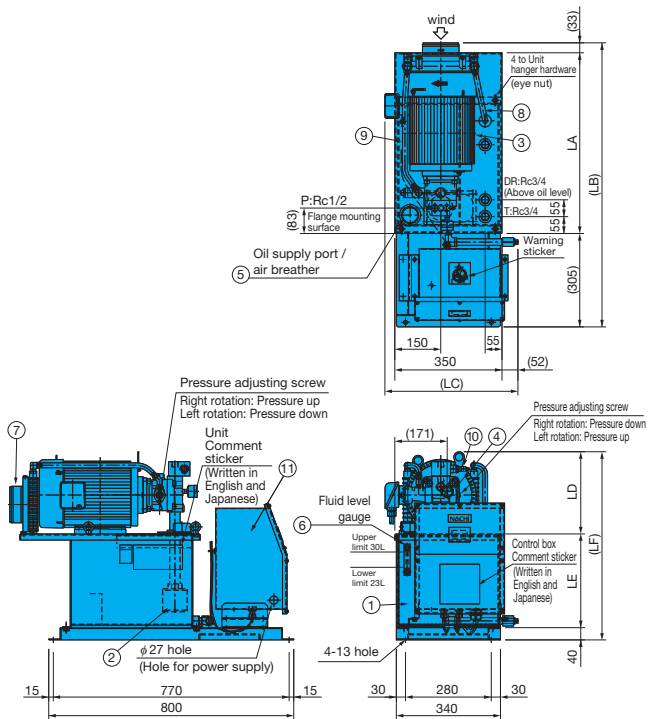
NSP-²⁰30E-****V**A*-15



Part No.	Part Name	Part No.	Part Name
1	Oil tank	7	Fan cooler
2	Suction strainer	8	Flexible hose
3	Uni-pump	9	Flexible hose
4	Pressure gauge	10	Pressure sensor
5	Fluid supply port/air breather	11	Inverter control box
6	Fluid level gauge		

26.0cm³/rev Series

NSP-³⁰40E-****V**2A*-15



8.0, 16.0cm³/rev Series

Model No.	Dimensions					Approximate Weight (kg)
	LA	LB	LC	LD	LE	
NSP-20E-15V*A*-15	425	750	243	262	545	66
NSP-20E-22V1A*-15	455	780	256		558	74
NSP-30E-15V*A*-15	425	750	236	364	647	71
NSP-30E-22V1A*-15	455	780	256		666	79

26.0cm³/rev Series

Model No.	Dimensions							Approximate Weight (kg)
	LA	LB	LC	LD	LE	LF	Z	
NSP-30E-22V2A*-15	565	903	405	234	306	581	21	101
NSP-30E-37V2A*-15	590	928	434	268		614	27	110
NSP-40E-22V2A*-15	565	903	405	234	385	660	21	106
NSP-40E-37V2A*-15	590	928	434	268		693	27	115

Precautions

- Turning the inverter on and off by cutting the main power supply (circuit breaker) significantly reduces the life of the inverter and should be limited to once an hour.
Contact us if you need to start and stop operations frequently.
- Use only the wiring methods described in the user documentation.
- Do not change any settings, regarding the inverter parameters, except the parameters described in the setting procedures in the user documentation.
- Maximum peak pressure (set pressure + surge pressure) must be 14MPa or below for the 8 and 16cm³/rev series, and 13MPa or below for the 26cm³/rev series.
Install a relief valve to cut surges in the circuit if the maximum peak pressure exceeds these figures.
If the maximum peak pressure is high, the inverter's alarm may sound and the motor may stop.



NNP Series (Low-noise Standard Variable Pump Unit)

Features

Newly developed compact variable pump unit has environmentally friendly low hydraulic oil temperature for cutting and manufacturing equipment hydraulic units. Extensive lineup in the series to handle requirements exactly.

Low hydraulic oil temperature = room temperature + 7°C

NNP-20-22P16 N1-21
60Hz, 7MPa Full cut-off in continuous operation

Fan to cool pump drain is standard equipment, hydraulic oil temperature are kept low using tank construction focused on anti-foaming.

A wide selection of models from which to choose

Basic Series: 10 types
Pump Variable Controllers: 5 types
Options: 8 types

A wide range of models provides a selection of capacity levels, and selecting a variable control mechanism helps to reduce energy needs.

Specifications

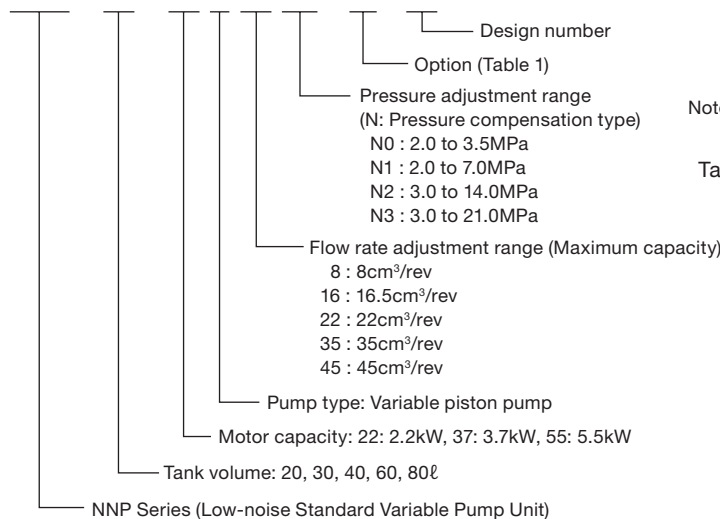
Power supply: AC200V-50/60Hz AC220V-60Hz

Model No.	Pump Capacity cm ³ /rev	Motor capacity kW-P	Maximum Pressure {Full Cutoff Pressure} MPa(kgf/cm ²)	Tank Capacity ℓ	Fan Cooler Motor Input W{at50/60Hz}	Standard Weight kg	
NNP-20-22P8N*-**-21	8.0	2.2-4	21{214}	20	16/15W Single-phase	80 ^{Note)}	
NNP-20-37P8N*-**-21		3.7-4		20		88 ^{Note)}	
NNP-20-22P16N*-**-21	16.5	2.2-4		20		85 ^{Note)}	
NNP-30-37P16N*-**-21		3.7-4		30		93 ^{Note)}	
NNP-20-22P22N*-**-21	22.0	2.2-4		14{143}		20	85 ^{Note)}
NNP-30-37P22N*-**-21		3.7-4				30	93 ^{Note)}
NNP-40-37P35N*-**-21	35.0	3.7-4	21{214}	40	35/33W Single-phase	115 ^{Note)}	
NNP-60-55P35N*-**-21		5.5-4		60		135 ^{Note)}	
NNP-80-37P45N*-**-21	45.0	3.7-4	14{143}	80		133 ^{Note)}	
NNP-80-55P45N*-**-21		5.5-4		80		140 ^{Note)}	

Note) Operating fluid is not included in options

Explanation of model No.

NNP - 20 - 22 P 16 N2 - ** - 21



Note) N3 is not available for flow rate adjustment ranges 22 and 45.

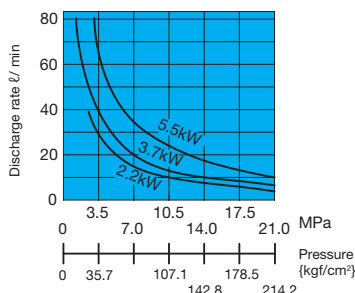
Table 1: Option Symbols (Specify in alphabetic sequence.)

Symbol	Description
F*	F*Type block (See block specifications.)
R*	R*Type block (See block specifications.)
G	Fluid level gauge guard
H	Temperature switch (Contact on at oil temperature of 65°C)
M	Microseparator
P	Bottom oil pan
S	Float switch (Contact on at fluid low limit level)
T	Fluid level gauge with temperature gauge (with guard)
W	Self Leak Test

Note) Return filter and fan cooler are equipped as standard.

Selecting a Motor

The lower sides of the curves for each of the motors shown in the graph indicate the operating range under rated output for that motor.

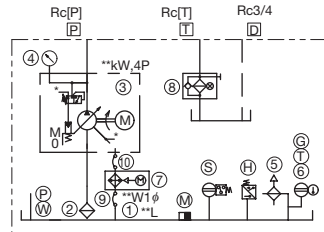
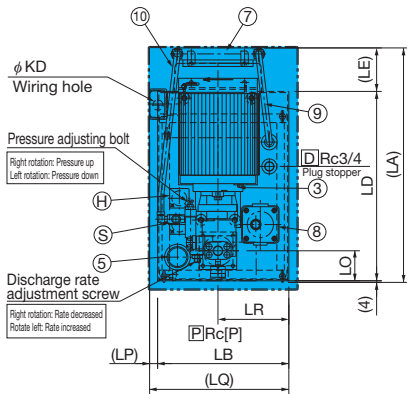


Tank Capacity and Motor/Pump Combinations

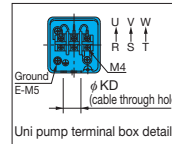
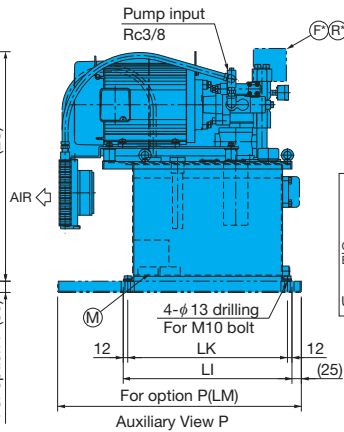
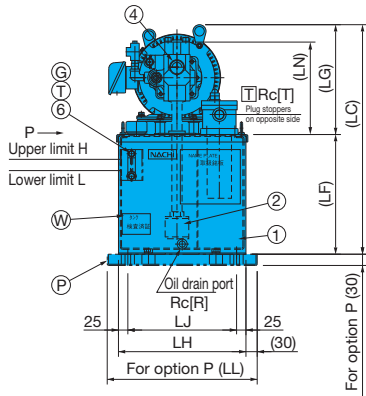
Tank Capacity (ℓ)	Motor capacity (kW-P)			2.2 - 4				3.7 - 4				5.5 - 4	
	Pump Capacity (cm ³ /rev)			8	16	22	8	16	22	35	45	35	45
20ℓ	○	○	○	○									
30ℓ					○	○							
40ℓ									○				
60ℓ												○	
80ℓ												○	○

Design Drawings, Dimension Tables

Model No.	Dimensions																							
	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	KD	H	L	P	T	R
NNP-20-22P 8N***-21														231								1/2		
NNP-20-22P16N***-21	575		506		66	240	266							235		350				20L	16L	3/4		
NNP-20-22P22N***-21		350		505				340	450	290	426	400	600	233	80			189				1/2	3/4	3/8
NNP-20-37P 8N***-21			533																φ27					
NNP-30-37P16N***-21	625			116			293							247		21	371			30L	26	3/4		
NNP-30-37P22N***-21			612			319																		
NNP-40-37P35N***-21			560			267								248		17	467			40L	30			
NNP-60-55P35N***-21			697			358	339							268		19	469			φ33	60L	50L		
NNP-80-37P45N***-21	743	450		620	119			440	560	390	536	500	770	248		17		257	φ27	80L	70L	1	1-1/4	1/2
NNP-80-55P45N***-21			747			293								268		17			φ33					
NNP-80-55P45N***-21			793			339								268		19			φ33					



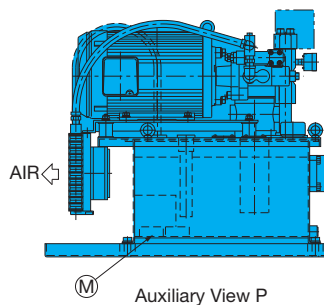
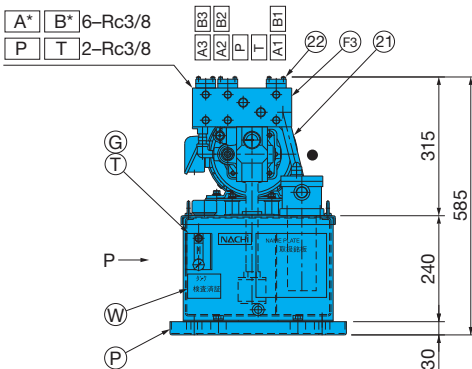
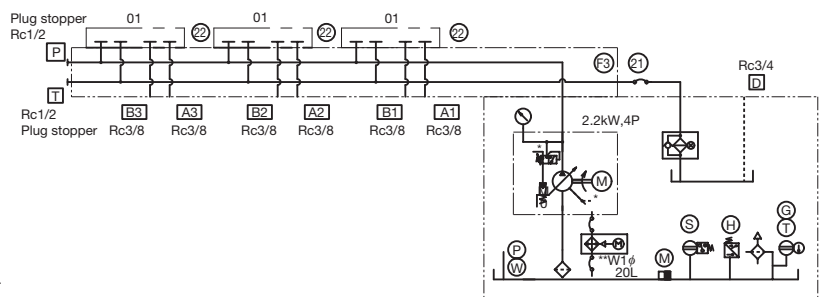
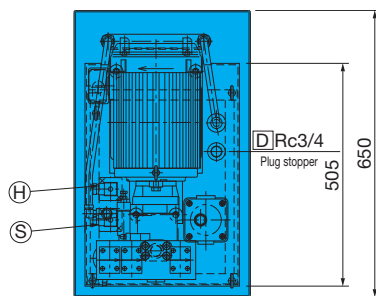
Part No.	Part Name
1	Fluid tank
2	Suction strainer
3	Uni-pump
4	Pressure gauge
5	Fluid supply port/air breather
6	Fluid level gauge
7	Fan cooler
8	Return filter
9	Flexible hose
10	Flexible hose



Part No.	Part Name
F*	Built-in block (F Type)
R*	Built-in block (R Type)
G	Fluid level gauge with guard
H	Temperature switch
M	Microseparator
P	Bottom oil pan
S	Float switch
T	Fluid level gauge with temperature gauge (with guard)
W	Self leak test

Option Installation Example

Model No. : NNP-20-22P16N2-F3HMPSTW-21



Symbol	Name
21	Flexible hose
22	End Plates

Note) Part numbers 21 and 22 are standard with a built-in block.

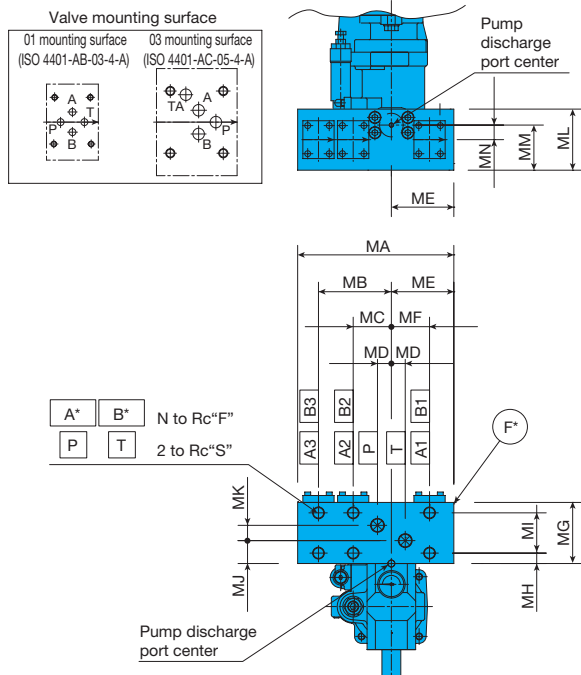
F* and R* Block Specifications

Note) Note that there are certain restrictions on block-equipped combinations. See the Selection Precautions on page L-32.

Options F1, F2, F3, F6

Symbol	Description	Model No.	
		Tank Capacity 20, 30ℓ	Tank Capacity 40, 60, 80ℓ
F1	F1 Type Block (01 x 1)	F1-1A	F1-2A
F2	F2 Type Block (01 x 2)	F2-1A	F2-2A
F3	F3 Type Block (01 x 3)	F3-1A	F3-2A
F6	F6 Type Block (03 x 1 - M6)	F6-1A-M6 (Standard M6)	F6-2A-M6 (Standard M6)

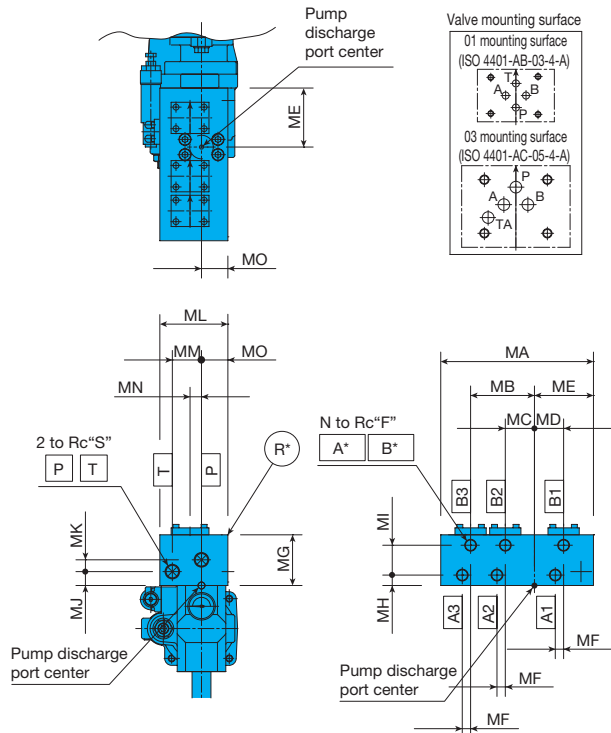
Tank Capacity	Options	Dimensions																
		MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	N	F	S
20ℓ 30ℓ	F1	133	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
	F2	175	—	55	20	90	55	88	15	58	33	22	88	65	21	4	3/8	1/2
	F3	225	105	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—
	F6	152	—	—	25	102	67	103	18	67	39	25	103	80	26	2	1/2	3/4
40ℓ 60ℓ 80ℓ	F1	143	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	
	F2	183	—	58	20	96	58	88	15	58	33	22	98	68	24	4	3/8	1/2
	F3	233	108	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—
	F6	155	—	—	25	105	70	103	18	67	39	25	103	73	—	2	1/2	3/4



Options R1, R2, R3, R6

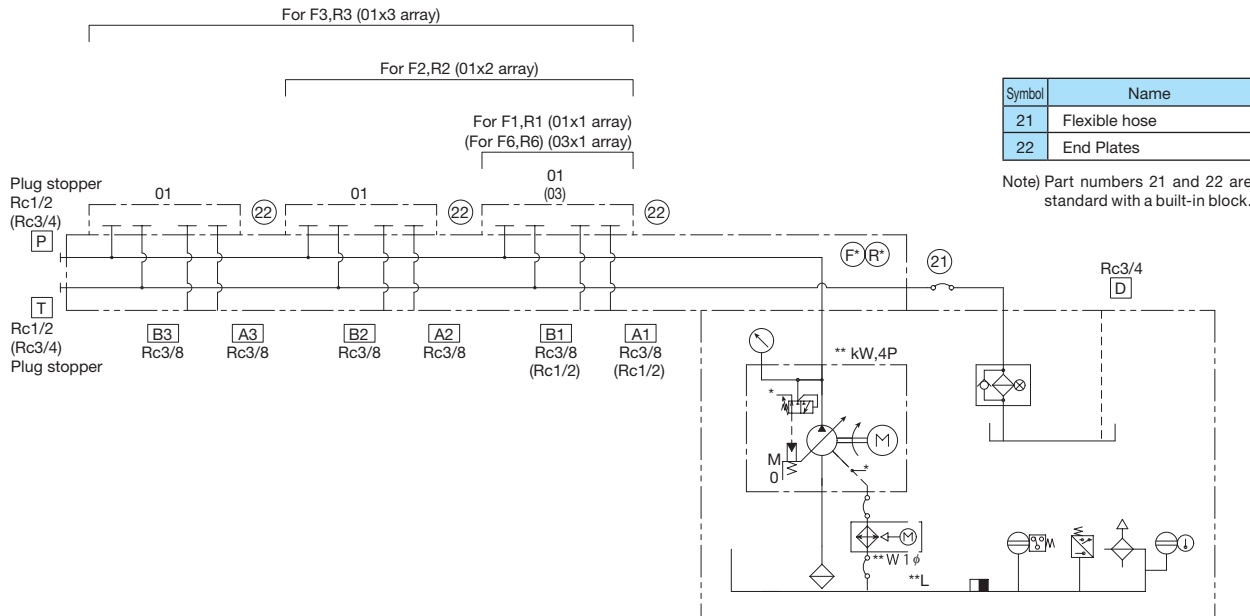
Symbol	Description	Model No.	
		Tank Capacity 20, 30ℓ	Tank Capacity 40, 60, 80ℓ
R1	R1 Type Block (01 x 1)	R1-1A	R1-2A
R2	R2 Type Block (01 x 2)	R2-1A	R2-2A
R3	R3 Type Block (01 x 3)	R3-1A	R3-2A
R6	R6 Type Block (03 x 1 - M6)	R6-1A-M6 (Standard M6)	R6-2A-M6 (Standard M6)

Tank Capacity	Options	Dimensions																	
		MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	N	F	S
20ℓ 30ℓ	R1	123	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	
	R2	170	—	42	42	85	12	73	15	43	20	17	98	42	16.5	38	4	3/8	1/2
	R3	220	92	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—	
	R6	160	—	—	54	119	0	98	18	62	49	0	108	47	9	—	2	1/2	3/4
40ℓ 60ℓ 80ℓ	R1	132	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—		
	R2	180	—	45	45	92	13	73	15	43	23	14	103	45	16.5	40	4	3/8	1/2
	R3	230	95	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—	
	R6	167	—	—	57	122	0	98	18	62	49	0	110	47	9	—	2	1/2	3/4



Note) Each block is shipped with plug stoppers in the P and T ports.

Hydraulic Circuit Diagram



Typical Performance Characteristics

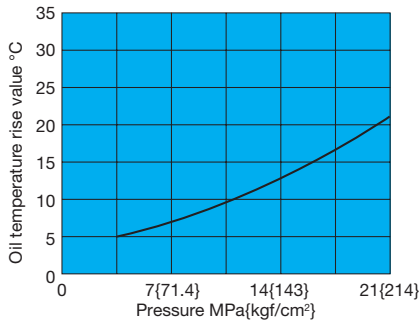
Oil Temperature Rise Characteristics - Full Cutoff

These graphs show oil temperature rise during continuous operation.

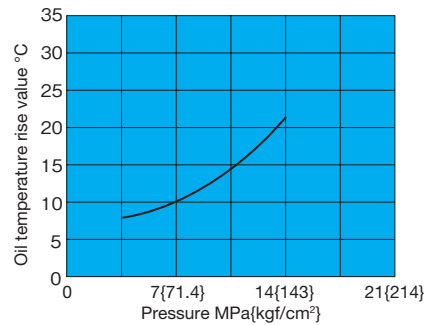
- Tank Fluid Pressure = Room Temperature + Oil Temperature Rise Value
- Operating Fluid: ISO VG32 equivalent
- Revolution Speed: 1800min⁻¹ (60Hz)

Note) The oil temperature rise value depends on actual operating conditions, and so actual temperatures may be different from those indicated above.

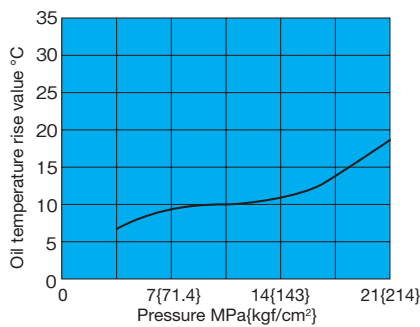
NNP-20-22P16N*-21



NNP-30-37P22N*-21



NNP-60-55P35N*-21



Noise Characteristics - Measurement Position

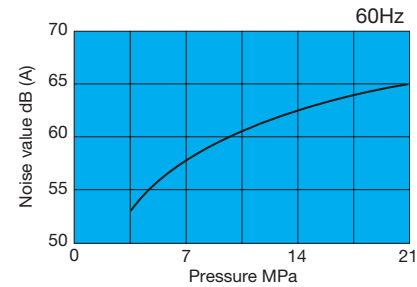
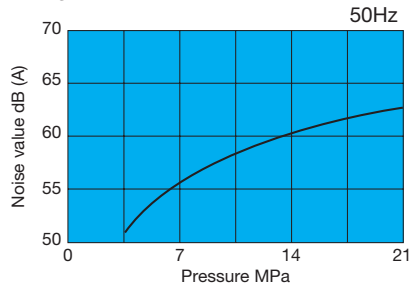
These graphs show noise values at locations one meter in front of and behind the pump.

- ISO VG32 equivalent
- Oil Temperature: 40±5°C

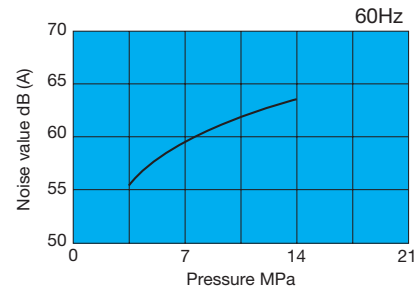
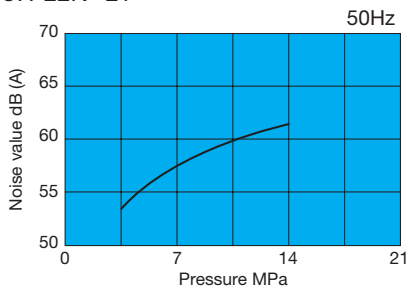
Note) Noise characteristics are affected by the condition of the floor and stand where the unit is mounted, whether there are noise reflective items nearby, and other factors. Such factors can produce different characteristics than those indicated below.

— Full cutoff

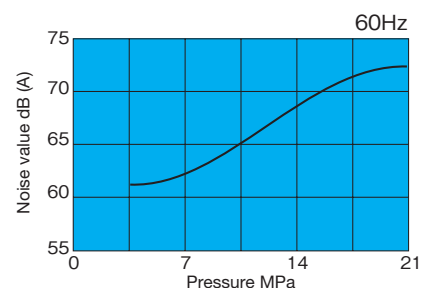
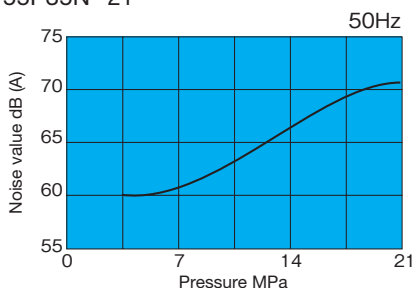
NNP-20-22P16N*-21



NNP-30-37P22N*-21



NNP-60-55P35N*-21



Selection Precautions

● Standard Accessories

A return filter with visual clogging inspection tool, and a fan cooler are equipped as standard.

● Options

- Options F* and R* cannot be selected for inclusion with an 8N* pump (NNP_**_**P8N* Type).
- For optional F* and R* blocks, up to three blocks can be specified for 01 size, and only one block can be specified for 03 size. Note, however, that the total weight of blocks and valves should not exceed 20kg.

· Tank Capacity 20ℓ, 30ℓ

Block Type	F1	F2	F3	F6	R1	R2	R3	R6
Block Weight (kg)	7.5	9.5	12.5	11.5	6.5	8.5	11.0	12.0
Allowable Additional Weight (kg)	12.5	10.5	7.5	8.5	13.5	11.5	9.0	8.0

· Tank Capacity 40ℓ, 60ℓ, 80ℓ

Block Type	F1	F2	F3	F6	R1	R2	R3	R6
Block Weight (kg)	8.5	11.0	14.0	11.5	7.0	9.5	12.0	12.5
Allowable Additional Weight (kg)	11.5	9.0	6.0	8.5	13.0	10.5	8.0	7.5

Note) M6 is the standard mounting tap for 03 size.

Handling Overview

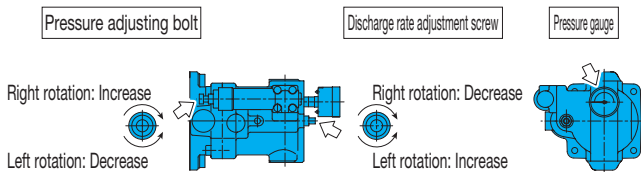
● Hydraulic Operating Fluid

- Use general oil-based operating fluid equivalent to viscosity grade ISO VG32 or 46. Just contact us regarding options to petroleum based hydraulic operating fluid. The following is the viscosity grade and operating pressure.
 - Up to 7.0MPa: ISO VG32
 - 7.0MPa or higher: ISO VG46
- Contaminated operating fluid can lead to malfunction and shortened pump life. Manage operating fluid so that contamination is maintained at class NAS10 or lower.

● Startup Precautions

- Before starting the pump, inch the electric drive to make sure there is hydraulic fluid being sucked up.
- Check to make sure that the operating fluid in the tank is at the prescribed level.
 - Upper Limit Mark (Yellow): Prescribed fluid level (nominal capacity)
 - Lower Limit Mark (Red): Minimum fluid level
- Do not touch the surface of the pump while it is operating, it is very hot.

● Adjusting the Pressure and Discharge Rate



- 01, 03 size solenoid valves and modular valves can be selected.
- With option F* and R*, block and cylinder piping is hoses, configured by Nachi.
- Contact your agent for information about equipping a circuit.
- Option P is a bottom type oil pan. The oil pan does not have an oil drain port. The oil drain port is secured in place with the same mounting holes as the hydraulic unit.
- Option W is a leak test performed by Nachi.

● Circuit Configuration

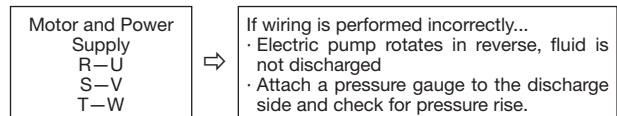
- Allow for sufficient flexibility in the piping between the NN pack, external manifold, and actuator. (Hose with a length of 1 m or more is recommended.)

● Paint

- Nachi-Fujikoshi standard color: Mancel No. 5B6/3 (lacquer). However, the electric drive is Munsell No. N7.
- Contact your agent about specifying external paint colors.

● Electrical Wiring

- Perform electrical wiring exactly as shown below.



- Do not forget to ground the pump!
 - After wiring is complete, be sure to cover the terminal box with the cover that comes with it.
 - Do not forget to wire the fan motor of the fan cooler. The power supply is single-phase 200V AC, non-polarity.
- Provide a no fuse breaker on the main power supply to protect electric circuitry against shorts and other current leakage, and as protection against motor overload. Also provide a leak breaker to protect against the risk of electric shock, etc.

● Air Intake and Exhaust

- Take care so there is nothing blocking the area around air intake and exhaust of the pump drain fan cooler. Also, be sure to locate the pump in a well-ventilated area where heat will not build up.

● Transport and Installation

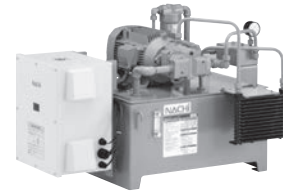
- Use the hangers when transporting the pump.
- Since this is a stationary type pump, secure it with bolts on a vibration-free, level surface.

● Maintenance and Inspection

- Oil Temperature: Use the pump in an area where the temperature is 10°C to 60°C.
- Operating Fluid Replacement Cycle: Perform the initial fluid replacement after three months of operation. After that, replace fluid when it becomes dirty or once a year, whichever comes first.
- Strainer and Tank Internal Inspection and Cleaning: Every three months
- Return Filter Element Inspection: Every three months (replace as required)
- Fan Cooler Fin Inspection and Cleaning: Every six months

● Environment

- Temperature: 10 to 35°C
- Avoid areas exposed to mist of water-soluble coolants, etc.



Inverter Drive NCP/NNP Series Energy-saving Variable Pump Unit with Inverter Drive

By adding an inverter drive to our NCP/NNP series standard variable pump unit, we created the inverter drive NCP/NNP series hydraulic units to achieve great energy savings.

They are great for jobs that need to dwell for long periods.

Features

Low increase in hydraulic oil temperature

Maintained at room temperature +2.5°C.

- NNP-60E-55P35N1-21
- 7MPa maintained while dwelling

40% energy savings compared to the NCP unit

- NCP-60E-3.7PV16N3-C1R2-13
- 21MPa while dwelling (in contrast to standard unit)

Quiet

Sound level is 52dB (A).

- NNP-20E-22P16N1-21
- 7MPa while dwelling
- One meter behind pump

Easy Operation

Can start as soon as power is turned on.

Absolutely no external commands or delicate electrical adjustments needed.

◎ Operates even with the inverter removed in emergencies.

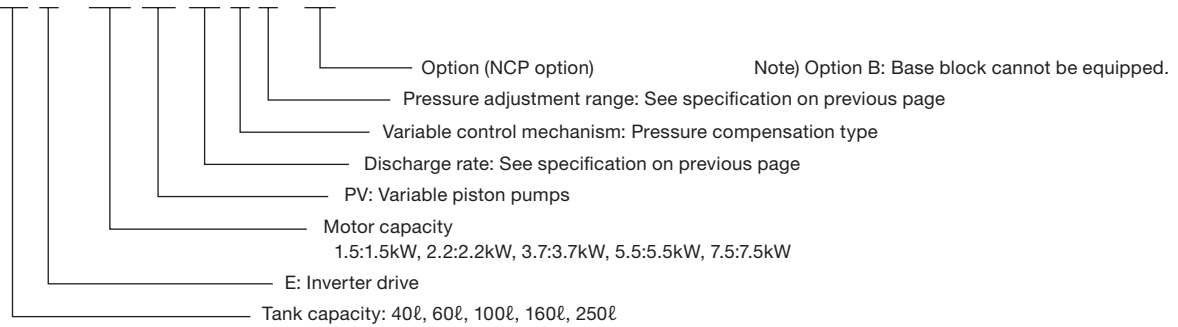
Specifications

1. Power Supply Rated Input Current	3φ AC200 to 220V, 50/60Hz 9.8A/1.5kW (NCP series only) 13.5A/2.2kW 22.5A/3.7kW 21.4A/5.5kW 29.1A/7.5kW (NCP series only)
2. Pressure Adjustment Range	N0: 2.0 to 3.5MPa N1: 2.0 to 7.0MPa N2: 3.0 to 14.0MPa N3: 3.0 to 21.0MPa
3. Output Flow (Theoretical Value at No-load)	8: 14.4ℓ/min 16: 29.7ℓ/min 22: 39.6ℓ/min 35: 63.0ℓ/min 45: 81.0ℓ/min
4. Hydraulic Fluid	Standard mineral-based hydraulic fluid ISO VG32 or 46
5. Hydraulic Oil Temperature	0 to 60°C
6. Ambient Temperature/Humidity	10 to 35°C/20 to 85%RH (non-condensation)
7. Color of Inverter Box	Munsell No. 2.5Y9/1 (cream)

Explanation of model No.

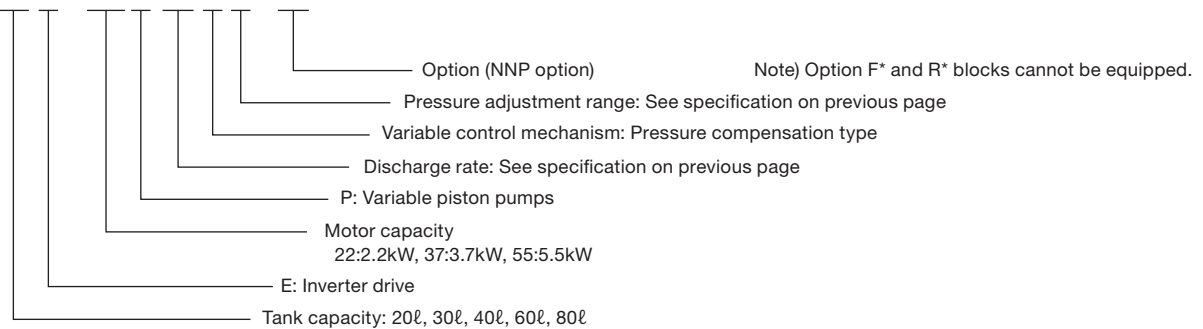
Inverter Drive NCP Series

NCP - 60 E - 3.7 PV 16 N 2 - ** - 13



Inverter Drive NNP Series

NNP - 20 E - 22 P 16 N 2 - ** - 21



Design Drawings, Dimension Tables

Contact us for more information.

Precautions

- Turning the inverter on and off by cutting the main power supply (circuit breaker) significantly reduces the life of the inverter and should be limited to once an hour.
Contact us if you need to start and stop operations frequently.
- Use only the wiring methods described in the user documentation.
- Do not change any settings, regarding the inverter parameters, except the parameters described in the setting procedures in the user documentation.
- Allow for sufficient flexibility in the piping between the inverter-driven hydraulic unit and external manifolds or actuators.

(Recommended) Flexible hose that is at least 1 meter long and has the following inside diameters.

Pump Capacity	Inside diameter
8cm ³ /rev	3/8 or 1/2 inch
16 or 22cm ³ /rev	3/4 inch
35 or 45cm ³ /rev	1 inch

*If the piping has a low capacity, the inverter's alarm may sound when the load fluctuates and the motor may stop.

- Some options are not compatible with the inverter drive models, contact us for more information.
- Contact us if excessive leakage in the external hydraulic circuit limits energy saving efficiency.



Power Meister

AC servo motor controls hydraulic pump speed and direction. Generate pressure and flow to match the operating cycle of machinery and to stop during idle times.

Incredible energy savings by only operating when necessary. Also, position, speed, and pressure are controlled with great precision by using a high-speed digital processing servo controller.

Features

- High power with 30MPa maximum pressure.
- Designed so pump operates only when necessary for energy savings and low noise.
- Great energy savings compared to conventional hydraulic systems.
- High-speed processing of the servo controller makes positioning on the order of μm possible.
- Compact all-in-one design saves space. (select either vertical or horizontal set-up)

Principle of operation

Rotating the motor forward brings hydraulic fluid to the head side of the cylinder which lifts the cylinder. Reversing the motor pushes hydraulic fluid to the rod side and pushes the cylinder down. The direction the pump rotates controls the direction of the cylinder, and the speed of rotation controls the speed.

System Configuration (Standard Configuration)

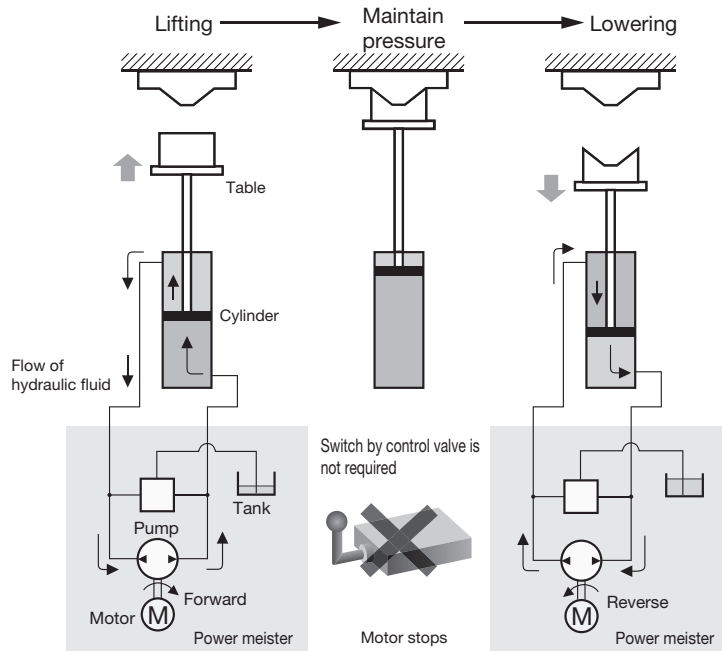
Signals to operate the cylinder (position, speed, and pressure) are sent from the control equipment to the servo controller and the hydraulic unit responds according to the signals. The servo controller receives feedback from sensors and accurately controls the cylinder so the deviation from the signals is 0. A feedback system using position and pressure sensors makes it possible to accurately control position, speed, and thrust (pressure).

About Power Meister

- Hydraulic unit (UPS)
- Servo controller (EPD)
- Servo amp (compatible with motor mounted on item ①)
- Motor cable (select from 3, 5, or 10 meters)
- Encoder cable (select from 3, 5, or 10 meters)
- Fan cable (select from 3, 5, or 10 meters) ...For 11kW motor
- Cable to computer (3 m)

It becomes offers.

Note) Customers must provide piping, wiring, hydraulic cylinder, sensors, control panel, and other equipment. (Contact us for information about cylinders and sensors.)



Specifications

Hydraulic Unit

Motor	AC servo motor (0.75 to 11kW (servo amp drive)) Power supply 3-phase 200 to 230VAC, 50/60Hz (servo amp power supply) For 11kW only : Fan motor power supply Single-phase 200 to 230VAC 50/60Hz is required
Pump	Piston pump (2.0 to 15.8cm ³ /rev)
Operating Ambient Temperature/Humidity	0 to +40°C/20 to 90%RH (non-condensation)
Temperature Range of Hydraulic Fluid (°C)	5 to 60°C (Note7)
Recommended Hydraulic Fluid	Wear resistant hydraulic fluid ISO VG32 to 68 (VG46 recommended)
Operating Viscosity Range	20 to 200mm ² /s {cSt}
Degree of Contamination	NAS 10 or better
Safety Valve Pressure Adjustment Range	UPS-00A : 3.5 to 32MPa UPS-0A/1A : 3.5 to 30MPa
Maximum Working Pressure	30MPa (for hydraulic pump) (maximum operating pressure varies according to motor performance and options)
Color of Paint	Black

●UPS-00A

Model No.	Motor Output kW	Pump Capacity cm ³ /rev	Maximum RPM min ⁻¹ (Note 1)	Maximum Flow Rate ℓ/min (Note 2)	Pressure Rating MPa (Continuous (Note 3))	Maximum Working Pressure MPa (Short term (Note 3))	Tank Size Lit. (nominal)	Hydraulic Fluid Level Range Lit. (estimate (Note 4))
UPS-00A-2*07	0.75	2.0	3000	6.0	6.4	9.6	V:0.75 H:0.65 L:No tanks (Note 5)	V:0.3 H:0.2
UPS-00A-2*10 UPS-00A-3*10	1.0	2.0 3.0	3000	6.0 9.0	8.5 5.7	12.7 8.5		
UPS-00A-2*15 UPS-00A-3*15 UPS-00A-4*15	1.5	2.0 3.0 4.0	3000	6.0 9.0 12.0	19.2 12.8 9.6	28.8 19.2 14.4		

●UPS-0A

Model No.	Motor Output kW	Pump Capacity cm ³ /rev	Maximum RPM min ⁻¹ (Note 1)	Maximum Flow Rate ℓ/min (Note 2)	Pressure Rating MPa (Continuous (Note 3))	Maximum Working Pressure MPa (Short term (Note 3))	Tank Size Lit. (nominal)	Hydraulic Fluid Level Range Lit. (estimate (Note 4))
UPS-0A-2*12 UPS-0A-4*12	1.2	2.0 4.0	3000	6.0 12.0	15.2 7.6	22.8 11.4	V:1.9 H:1.5	V:0.6 H:0.3
UPS-0A-2*20 UPS-0A-4*20	2.0	2.0 4.0	3000	6.0 12.0	25.4 12.7	30.0 19.0		

●UPS-1A

Model No.	Motor Output kW	Pump Capacity cm ³ /rev	Maximum RPM min ⁻¹ (Note 1)	Maximum Flow Rate ℓ/min (Note 2)	Pressure Rating MPa (Continuous (Note 3))	Maximum Working Pressure MPa (Short term (Note 3))	Tank Size Lit. (nominal)	Hydraulic Fluid Level Range Lit. (estimate (Note 4))				
UPS-1A-5*35 UPS-1A-7*35 UPS-1A-9*35 UPS-1A-11*35 UPS-1A-13*35 UPS-1A-16*35	3.5	4.7 6.7 9.0 11.0 12.9 15.8	2500	11.8 16.8 22.5 27.5 32.3 39.5	21.1 14.8 11.7 9.6 8.2 6.7	30.0 22.2 17.5 14.3 12.2 10.0	No symbol:4.5 A:3.0 B:6.0	Tank capacity:No symbol V:1.2, H:0.6 Tank capacity:A V:0.6, H:0.4 Tank capacity:B V:2.8, H:0.8				
UPS-1A-5*45 UPS-1A-7*45 UPS-1A-9*45 UPS-1A-11*45 UPS-1A-13*45 UPS-1A-16*45		4.7 6.7 9.0 11.0 12.9 15.8		2500	11.8 16.8 22.5 27.5 32.3 39.5	30.0 22.6 17.8 14.6 12.4 10.2			30.0 30.0 26.8 21.9 18.7 15.2			
UPS-1A-7*55 UPS-1A-9*55 UPS-1A-11*55 UPS-1A-13*55 UPS-1A-16*55		6.7 9.0 11.0 12.9 15.8			2500	16.8 22.5 27.5 32.3 39.5			27.9 22.0 18.0 15.3 12.5	30.0 30.0 27.0 23.0 18.8		
UPS-1A-9*75 UPS-1A-11*75 UPS-1A-13*75 UPS-1A-16*75		9.0 11.0 12.9 15.8				2500			22.5 27.5 32.3 39.5	30.0 24.7 21.0 17.2	30.0 30.0 30.0 25.8	
UPS-1A-13*11K UPS-1A-16*11K		12.9 15.8							2500	32.3 39.5	30.0 25.1	30.0 30.0

<Selection Precautions>

The Power Meister is a hydraulic system that directly drives the hydraulic cylinder by accelerating, decelerating, or stopping a motor. Because torque, separate from the motor torque needed to generate pressure, is needed to accelerate and decelerate, the maximum flow rate and maximum pressure may be lower than in the above table due to restrictions caused by the machinery's operating conditions.

When you select a product, you first need to clarify the operating cycle and load of your machinery (the hydraulic cylinders that the Power Meister will drive) in advance and then consult with us.

(Note 1) There is a limit to the operating pressure at maximum RPMs due to the low torque that is characteristic of this motor's output at high RPMs.

(Note 2) Theoretical flow under no load. Actual flow varies according to load pressure.

(Note 3) Rated pressure is rated torque of the motor, maximum operating pressure is pressure output at 150% torque. However, if this pressure exceeds 30 MPa, the maximum operating pressure of the hydraulic unit is below 30 MPa. Also, the maximum RPM and operating pressure may be limited depending on the acceleration, deceleration, and load conditions. Clarify your machinery's operating conditions first, and contact us for more information.

(Note 4) If the fluctuation in oil volume is greater than the allowed values an auxiliary tank can be connected to resolve this. Contact us for more information.

(Note 5) If your selection does not include a tank, then a separate oil tank is required. We can also manufacture oil tanks, so contact us for more information if you are interested.

(Note 6) The temperature of the hydraulic fluid is affected by many factors, such as the hydraulic unit's operating environment, operating methods, and load conditions. The customer must confirm the unit's actual continuous operating conditions. Also, long-term, continuous operation under pressure or high-frequency reciprocal operation may result in increased oil temperatures. Therefore, operating pressure limits or installation of a cooling system may be necessary. Contact us for more information.

Servo Controller

Model No.: EPD-PD3-10-D2-20

Power Supply/Consumption	24VDC ±15%/less than 10W	Separate power supply for sensor is needed
Operating Ambient Temperature/Humidity	0 to +55;/90% RH or less (no condensation)	
Controlled Parameters	Cylinder position, speed, pressure	Control mode automatic switching function available
Command Input	Speed Command	Analog voltage DC ±10V/maximum cylinder speed ^(*) , cylinder extended by positive voltage, cylinder retracted by negative voltage
	Pressure Command	Analog voltage DC ±10V/maximum control pressure ^(*) , positive voltage adds pressure to head side, negative voltage adds pressure to rod side
	Position Command	Position selection contact signal (4 contacts), target position selected by bit pattern of 4 contacts, acceleration function generated in controller moves cylinder to target position
Input Signals (Contact Signals)	Servo on, alarm reset, control mode external switching, start point search start, start point retraction end point LS, start point proximity LS	
Output Signals	Alarm, servo ready, control mode monitor, start point search end/in position (also output), pressure consistency	
Pressure Sensor Input	Analog voltage 0.5 to 4.5V, or 1 to 5V (2ch)	Uses pressure sensor with response time of 1 ms or less.
Position Sensor Input	90° phase difference biphasic pulse, start point pulse (line receiver input) or analog voltage 0 to 10V (only with -A option)	If using pulse output position sensor, start point search is necessary once after turning on the power Pulse output positioning sensor: Uses sensor with resolution of 1 μm or less Analog voltage output positioning sensor: Uses sensor with response time of 2 ms or less
Servo Amp I/F	Output: Motor revolve command (analog voltage ±10VDC), servo amp, servo alarm reset Input: Servo alarm, servo ready	
Control Panel	5 digits with symbol, 4 key input, selector switch	data setting/display, test run function

- Connector for controller, pins are attached.
- When you use the spacer for the servo controller (Option:FZV-8676-02A-01), the installation dimension becomes the same as the old design [EPD-PD2-10(-A)-D2-10]and the height from the mounding surface to the connector becomes almost the same.

Servo Amp

Hydraulic Unit Model (UPS Series)	Motor Output kW	Compatible Servo Amp Model	Remarks
UPS-00A-**07	0.75	EPA-PD1-10-R075-20	Regenerative resistor built in
UPS-00A-**10	1.0	EPA-PD1-10-R100-20	
UPS-00A-**15	1.5	EPA-PD1-10-R150-20	
UPS-0A-**12	1.2	EPA-PD1-10-R120-20	
UPS-0A-**20	2.0	EPA-PD1-10-R200-20	
UPS-1A-***35	3.5	EPA-PD1-10-R350-20	
UPS-1A-***45	4.5	EPA-PD1-10-R450-20	
UPS-1A-***55	5.5	EPA-PD1-10-R550-20	External regenerative resistor included
UPS-1A-***75	7.5	EPA-PD1-10-R750-20	
UPS-1A-***11K	11.0	EPA-PD1-10-R11K-20	

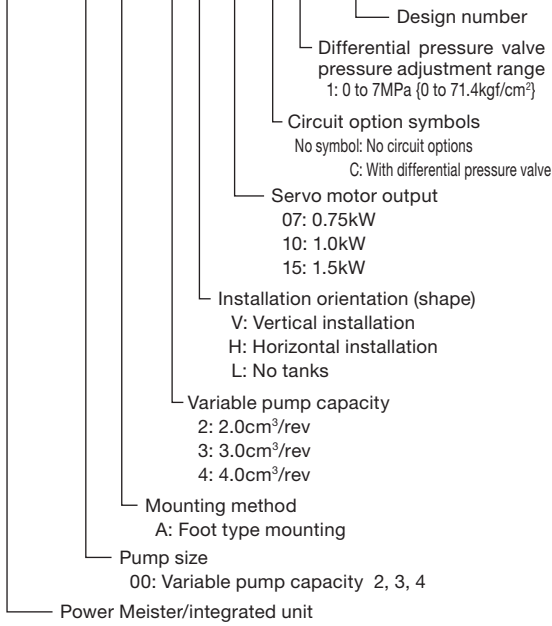
- Note 1) Power: 3-phase 200 to 230VAC, 50/60Hz
 Note 2) Separate motor cable and encoder cable are needed to connect the servo motor on the hydraulic unit.
 Note 3) An auxiliary external regenerative resistor may need to be added in some operating conditions if the built-in or external regenerative resistor is not sufficient.
 For more details contact us with information about your operating conditions (load motion diagram).
 Note 4) A cable connector is included.

Explanation of model No.

Hydraulic Unit

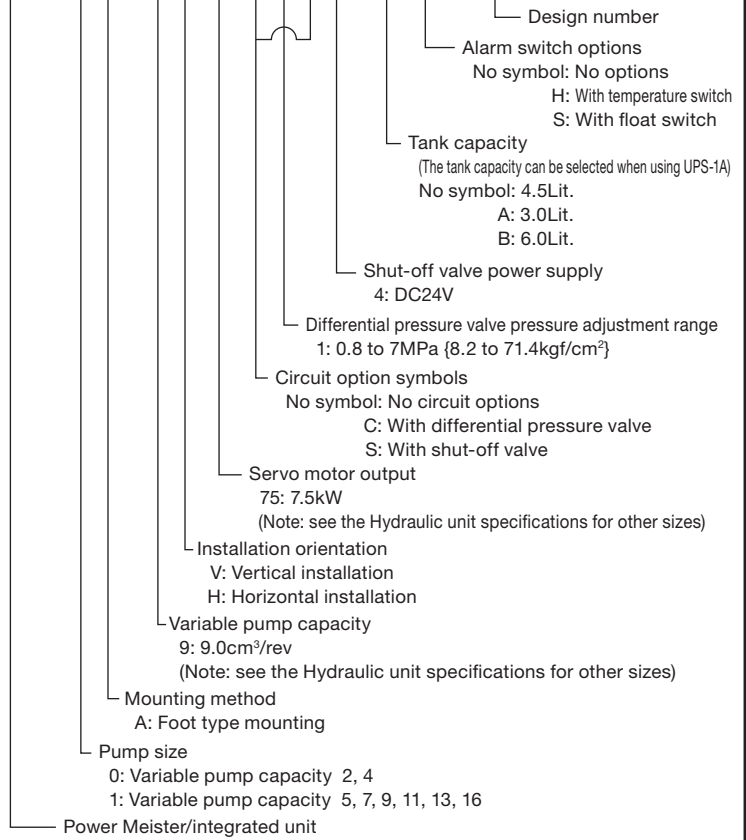
●UPS-00A

UPS - 00 A - 2 H 07 C 1 - 20



●UPS-0A/UPS-1A

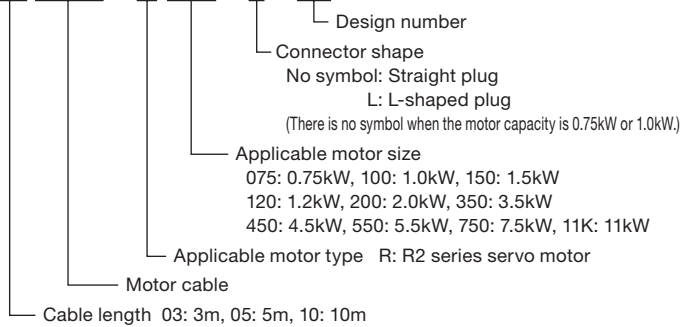
UPS - 1 A - 9 V 75 C 1 S 4 - B HS - 20



Cable Kit Specification

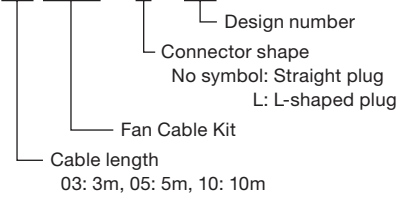
●Motor Cable Kit

JAQ - 03 ACM - R 150 - L - 20



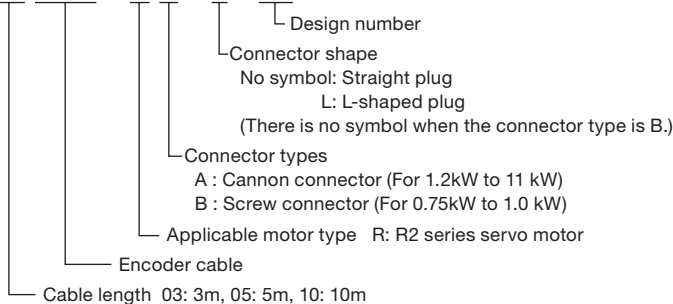
●Fan Cable Kit

JAQ - 03 ACF - L - 20



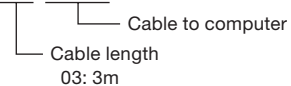
●Encoder Cable Kit

JAQ - 03 ACE - R A - L - 20



●Cable to computer Kit

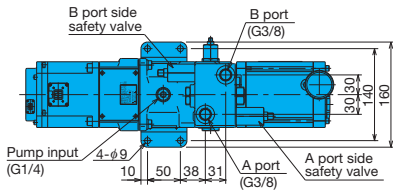
JAQ - 03 PMC - 8654A



Installation Dimension Drawings

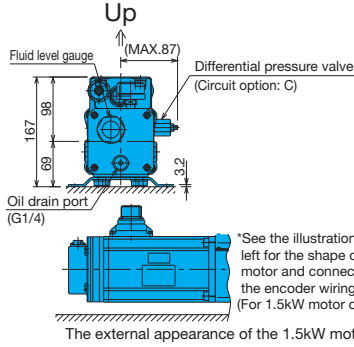
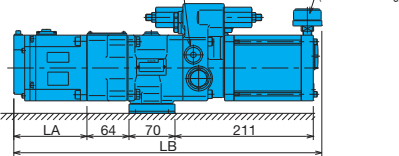
●UPS-00A Series Integrated Unit

UPS-00A-*H****(Horizontal Installation)

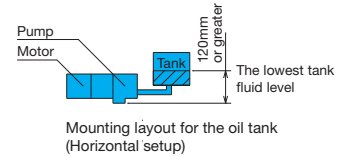
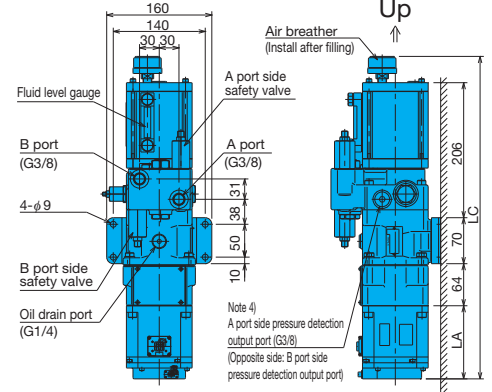
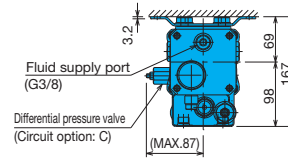


Note 4)

A port side pressure detection output port (G3/8)
(Opposite side: B port side pressure detection output port)



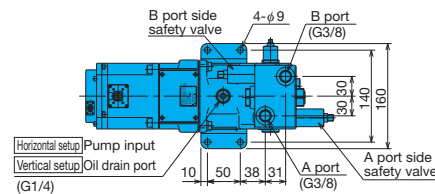
UPS-00A-*V****(Vertical Installation)



UPS Model No.	LA	LB	LC	Approximate Weight
UPS-00A-* _H 07	111	469	491	16kg
UPS-00A-* _H 10	128	486	508	17kg
UPS-00A-* _H 15	224	582	604	20kg

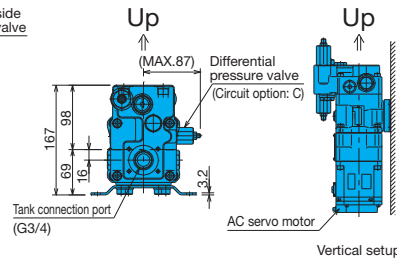
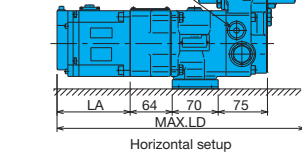
- Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C.
 Note 2) The air breather is included in the unit as a separate item. After filling the tank with oil, install the air breather.
 Note 3) Install the unit in a mounting orientation prescribed by Model No. (H: Horizontal installation, V: Vertical installation)
 Note 4) The B port side pressure detection output port can only be used when there are no "C" circuit options.

UPS-00A-*L****(No tanks)



Note 5)

A port side pressure detection output port (G3/8)
(Opposite side: B port side pressure detection output port)



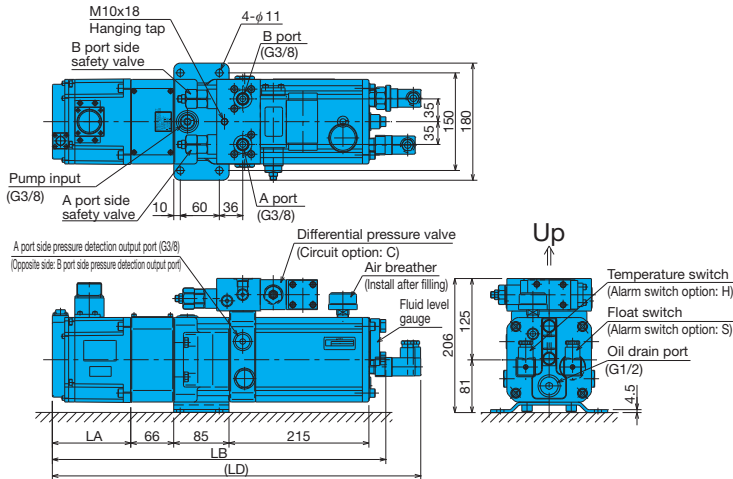
UPS Model No.	LA	LD	Approximate Weight
UPS-00A-*L07	111	377	14kg
UPS-00A-*L10	128	394	15kg
UPS-00A-*L15	224	490	18kg

- Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C.
 Note 2) An Oil tank will be required separately. We can also produce oil tanks. Contact us for requests for oil tanks.
 Note 3) Install horizontally or vertically. For vertical installation, install the servo motor facing down.
 Note 4) When installing the oil tank horizontally, make sure the lowest fluid level position during the cylinder operation is always 120mm or greater from the bottom of the unit. (See illustration on the upper right: Mounting layout for the oil tank)
 Note 5) The B port side pressure detection output port can only be used when there are no "C" circuit options.

●UPS-0A Series Integrated Unit

Circuit options: S (shut off valve) none

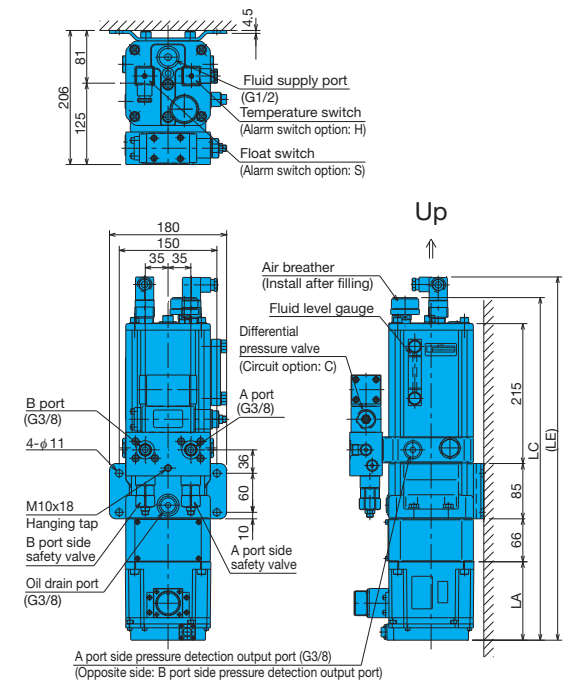
UPS-0A-*H**(Horizontal Installation)**



UPS Model No.	LA	LB	LC	LD	LE	Approximate Weight
UPS-0A-*H 12	121	513	527	567	559	30kg
UPS-0A-*H 20	160	552	566	606	598	33kg

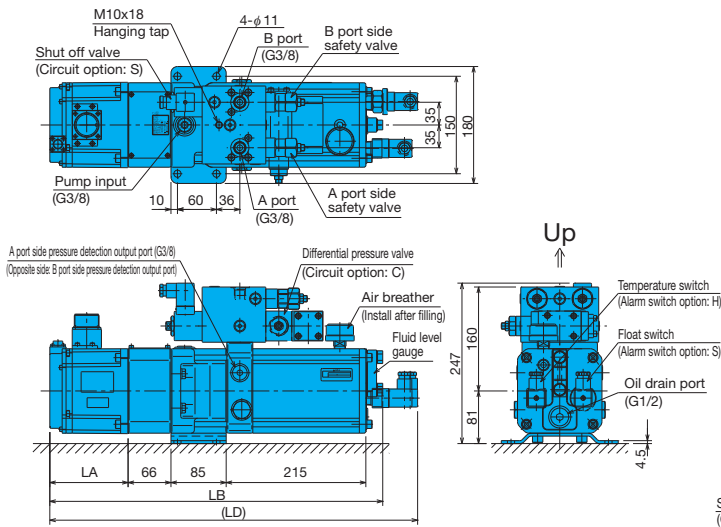
Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C and alarm switch options H and S.
 Note 2) Does not include circuit or alarm switch options or weight of hydraulic fluid.
 Note 3) The air breather is included in the unit as a separate item. After filling the tank with oil, install the air breather.
 Note 4) Install the unit in a mounting orientation prescribed by Model No. (H: Horizontal installation, V: Vertical installation)

UPS-0A-*V**(Vertical Installation)**

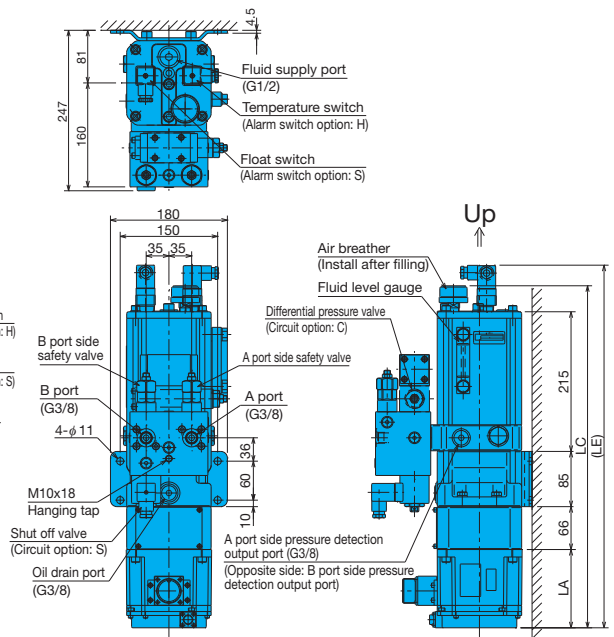


Circuit options: S (shut off valve) attached

UPS-0A-*H**S4(Horizontal Installation)**



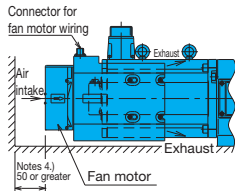
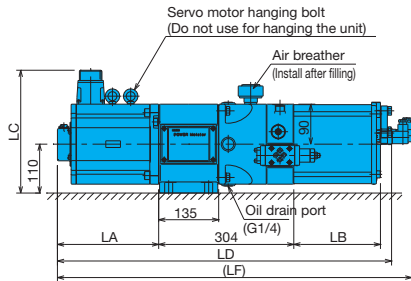
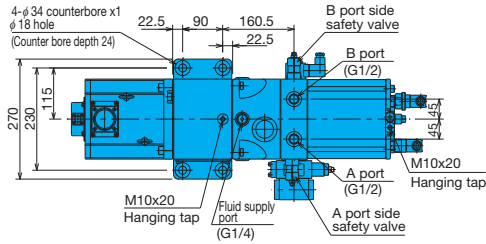
UPS-0A-*V**S4(Vertical Installation)**



*The dimension table and Notes 1 to 4 are in common with when there is no circuit option:S (Shut off valve)

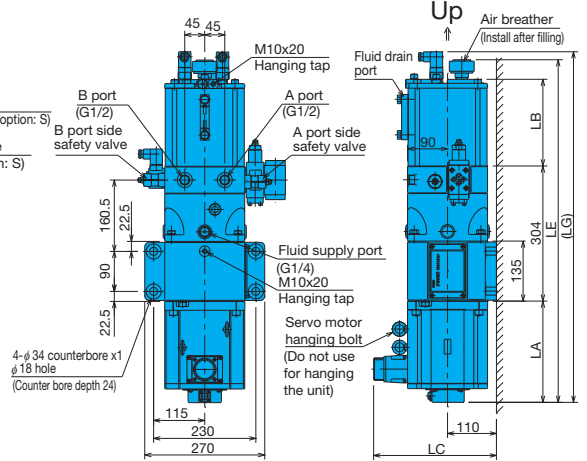
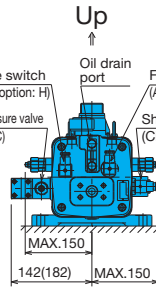
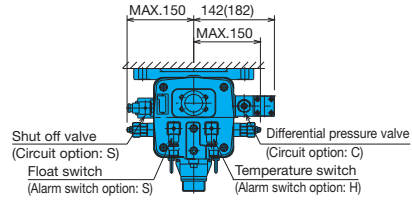
●UPS-1A Series Integrated Unit

UPS-1A-H****(Horizontal Installation)**



The external appearance of a 11kW motor
 *For 11kW motor output only, the fan motor is provided.

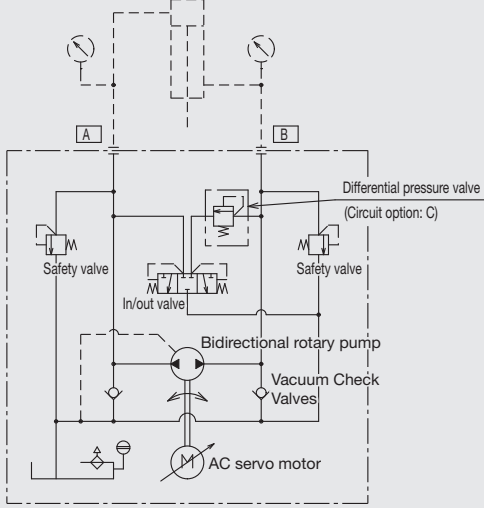
UPS-1A-V****(Vertical Installation)**



UPS Model No.	LA	LB	LC	LD	LE	LF	LG	Approximate Weight ^{Note 2)}
UPS-1A- ^V _H 35****-A	159	120	254	608	627	654	645	60kg
UPS-1A- ^V _H 35****		195		683	702	729	720	61kg
UPS-1A- ^V _H 35****-B		275		763	782	809	800	63kg
UPS-1A- ^V _H 45****-A	176	120	254	625	644	671	662	64kg
UPS-1A- ^V _H 45****		195		700	719	746	737	65kg
UPS-1A- ^V _H 45****-B		275		780	799	826	817	67kg
UPS-1A- ^V _H 55****-A	228	120	276	677	696	723	714	70kg
UPS-1A- ^V _H 55****		195		752	771	798	789	71kg
UPS-1A- ^V _H 55****-B		275		832	851	878	869	73kg
UPS-1A- ^V _H 75****-A	273	120	276	722	741	768	759	78kg
UPS-1A- ^V _H 75****		195		797	816	843	834	79kg
UPS-1A- ^V _H 75****-B		275		877	896	923	914	81kg
UPS-1A- ^V _H 11K****-A	395	120	276	844	863	890	881	85kg
UPS-1A- ^V _H 11K****		195		919	938	965	956	86kg
UPS-1A- ^V _H 11K****-B		275		999	1018	1045	1036	88kg

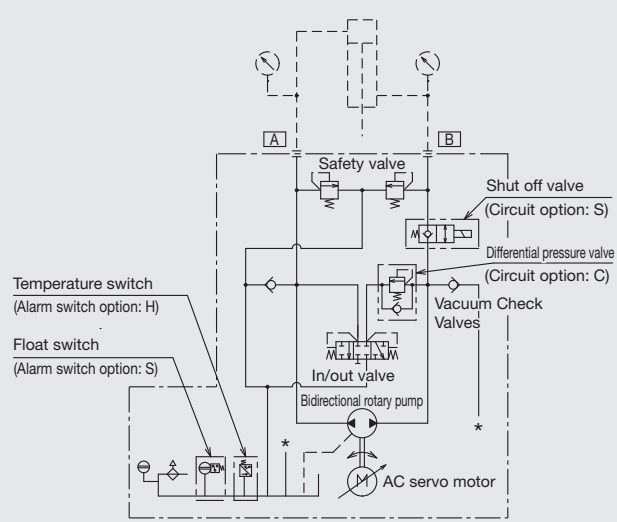
Note 1) Dimensions in (parentheses) and two-dot chain lines are for circuit options C and S and alarm switch options H and S.
 Note 2) Does not include circuit or alarm switch options or weight of hydraulic fluid.
 Note 3) The air breather is included in the unit as a separate item. After filling the tank with oil, install the air breather.
 Note 4) For 11kW motor output only, the fan motor is provided. When installing the unit, provide space of 50mm or greater for air intake of the fan motor.
 Note 5) Install the unit in a mounting orientation prescribed by Model No. (H: Horizontal installation, V: Vertical installation)

Hydraulic circuit diagram (UPS-00A)



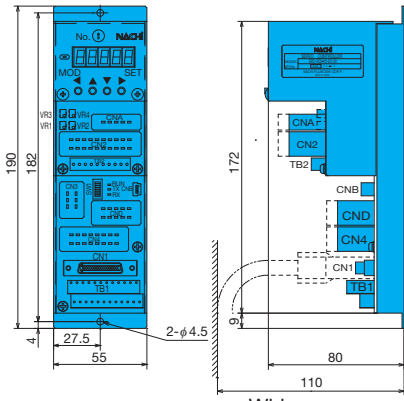
When maintaining the position of the cylinder during servo off is required for example when preventing the cylinder from self-weight falling, additional circuits (for example shut-off valve) will be required. Contact us for more information.

Hydraulic circuit diagram (UPS-0A, 1A)



● Servo Controller

EPD-PD3-10-D2-20



Approximate Weight: 0.5kg

● Servo Amp

0.75kW Motor
1.0kW Motor

Approximate Weight: 1.0kg

1.2kW Motor
1.5kW Motor

Approximate Weight: 1.7kg

2.0kW Motor

Approximate Weight: 5.0kg

3.5kW Motor
4.5kW Motor
5.5kW Motor

Approximate Weight: 5.3kg

7.5kW Motor
11kW Motor

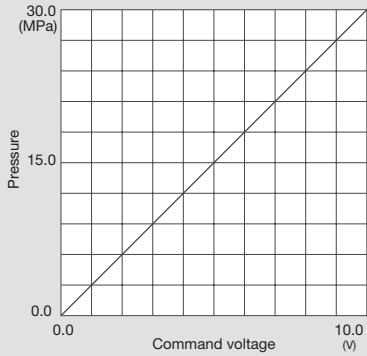
Regenerative resistor

Approximate Weight: 9.6kg

Approximate Weight: 3.0kg

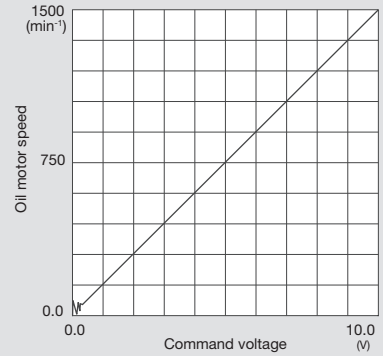
Performance Characteristics

● Pressure Command Voltage - Pressure Characteristics (0 to 100%)



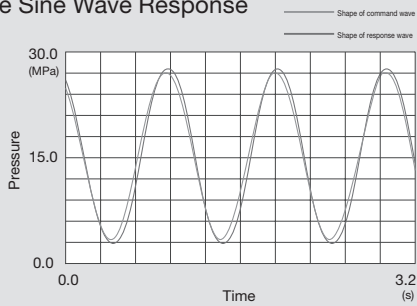
Command 10V for 30MPa From low pressure 0.15MPa
 0V → 10V → 0V command To high pressure 30MPa

● Speed Command Voltage - Speed Characteristics (0 to 100%)



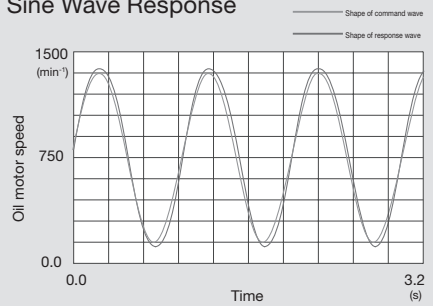
Command 10V to 1500min⁻¹ From low speed 50min⁻¹
 0V → 10V → 0V command To high-speed 1500min⁻¹
 (If oil motor is running as actuator)

● Pressure Sine Wave Response



Command 1Hz sine wave, amplitude 10 to 90%

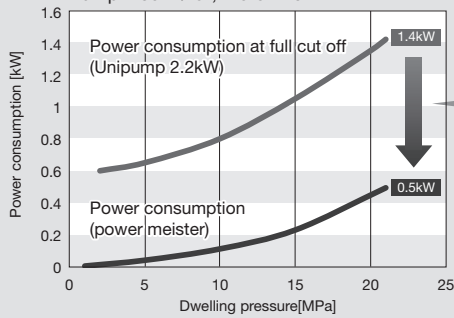
● Speed Sine Wave Response



Command 1Hz sine wave, amplitude 10 to 90%
 (If oil motor is running as actuator)

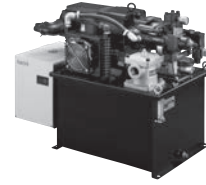
● Dwelling Pressure - Power Consumption Characteristics

Hydraulic unit (UPS)
 Pump 4.0cm³/rev, Motor 2.0kW



Energy savings
0.9kW (Approximately 65%)
 At 21 MPa dwelling pressure

Control equipment: Unipump 2.2kW (variable piston pump)
 Full cut off power consumption (N=1800min⁻¹)
 (Note) Characteristics vary depending on operating conditions.



Power Fit

❖ Power fit is an energy-saving hydraulic unit that operates the variable piston pump with two capacities using an AC servo motor.

Features

① Energy-saving, low-noise

Energy-savings and low noise are achieved by rotating the pump for the required number of times only when it is necessary by the AC servo motor .

② High pressure, large flow rate

By using the variable piston pump with two capacities, the two pump capacities switch between the low pressure large flow rate and high pressure small flow rate to control.

③ Easy control of multi-stage pressure and flow rate

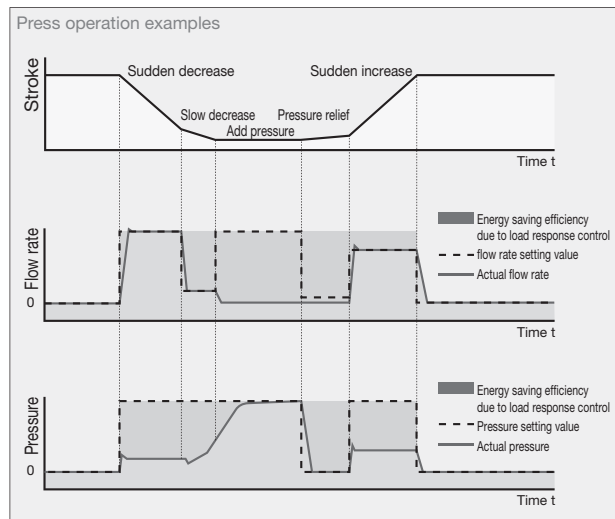
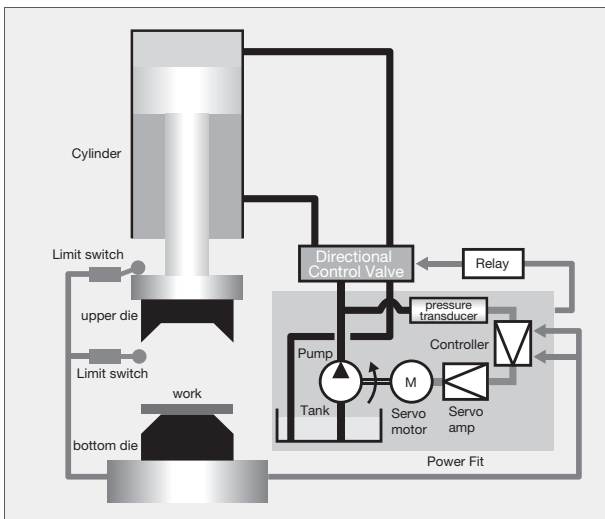
By using external signals, 16 patterns of changeover controls are possible. The pressure and flow rate can be freely set with the operation panel inside the control box.

④ Compact

By making the Power Fit energy-saving, the oil quantity will be reduced.

Overview

- Power Fit can be used to replace the existing hydraulic unit.
- The operating direction of the cylinder can be switched by the external directional control valve.
- Cylinder speed (flow rate) and load (pressure) can be controlled freely by the controller. (Valves for controlling speed and pressure are unnecessary.)
- The controller automatically switches the flow rate control and pressure control according to the loaded condition.
- External signals (Open Collector signals) can be output in conjunction with the flow rate and pressure command. The directional control valve can be switched in conjunction with the commands.



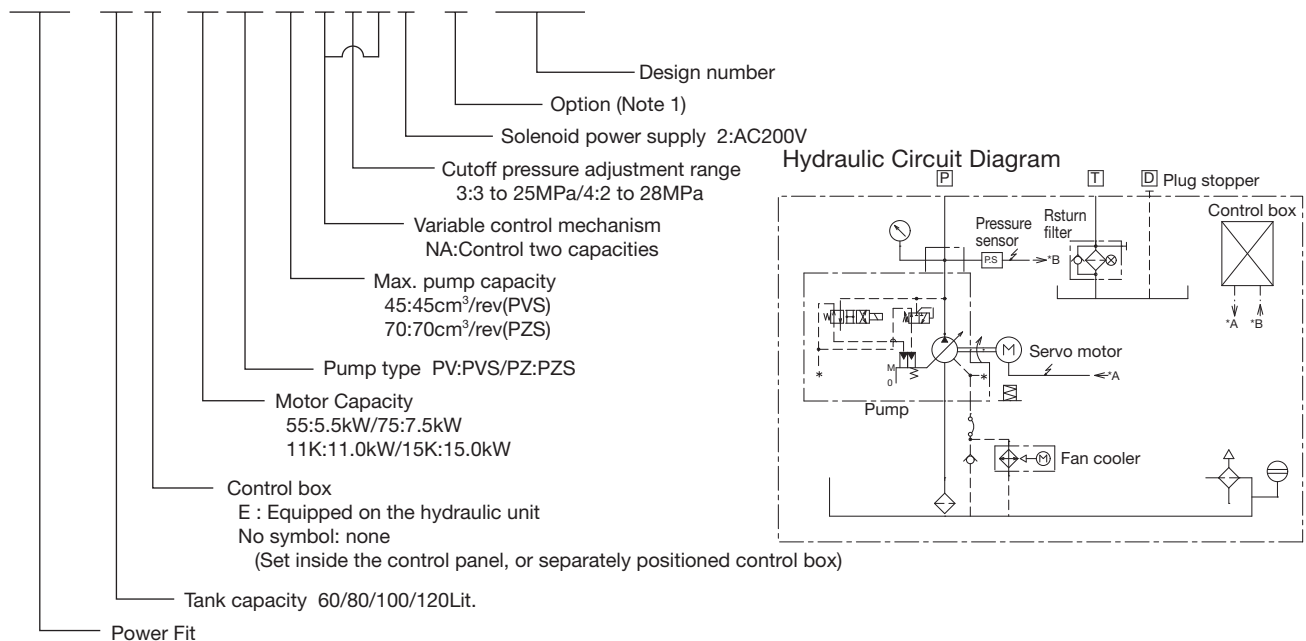
Specifications

Model No.	NPQ-60*-55PV 45N3A2-6161B	NPQ-80*-75PZ 70N4A2-6161B	NPQ-100-11KPZ 70N4A2-6161B	NPQ-120-15KPZ 70N4A2-6161B
Motor capacity kW	5.5	7.5	11.0	15.0
Pump	PVS-2B-45		PZS-3B-70	
Max. pump capacity cm ³ /rev	45		70	
Pump adjustment range high volume cm ³ /rev	20 to 45 ^(Note 1) (Factory default : 45)		5 to 70 ^(Note 1) (Factory default : 70)	
Pump adjustment range small volume cm ³ /rev	3 to 24 ^(Note 1) (Factory default : 12)		5 to 40 ^(Note 1) (Factory default : 17)	
Maximum RPM min ⁻¹	2000			
Maximum flow rate ℓ/min	90		140	
Pressure Rating MPa	21			
Maximum Working Pressure MPa	25		28	
Tank Size Lit.	60	80	100	120
Power supply	Main circuit	3φ AC200 to 220V, 50/60Hz		
	control circuit	1φ AC200 to 220V, 50/60Hz		
Power Supply Capacity KVA	8.4	12.6	15.7	21.4
Ambient Temperature/Humidity	10 to 35°C/20 to 90%PH(non-condensation)			
Temperature Range of Hydraulic Fluid	10 to 60°C			
Recommended Hydraulic Fluid	Standard mineral-based hydraulic fluid (equivalent to ISO VG46s)			

Note 1) The adjustment range of the pump high volume changes according to the setting of the small volume. For details see the user documentation.

Explanation of model No.

NPQ-80 E-75 PZ 70 N 4 A 2-**-6161B

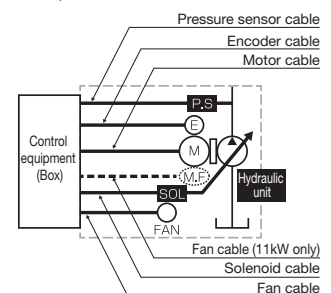


Note 1) G:Fluid Level Gauge With Guard, H:With Thermostat, M:With Microseparator, P:With Oil Pan
S:Float Switch (Low fluid level detection), T:Fluid Level Gauge With Temperature Gauge (with guard)
W:Self Leak Test (The return filter is standard equipment)

Hydraulic unit (Control box non-equipped type), Control equipment, Cable Kit Combinations List

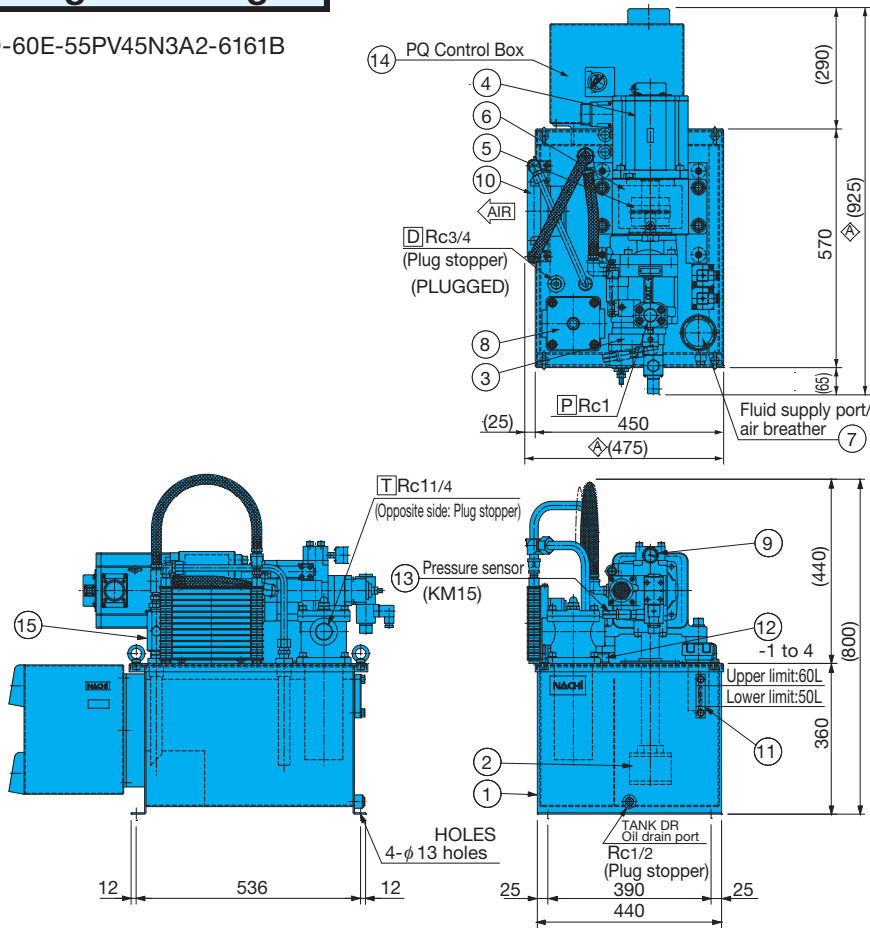
Hydraulic unit (Control box non-equipped type) Model No. (PQ Bellmount pump Model No.)	Motor capacity (kW)	Control equipment Select from the following ① PQ Amplifier unit ② Separately positioned control box	Cable Kit ^(Note 1) (Select from 3m or 5m)
NPQ-60-55PV45N3A2-6161B (UPQ-2A-45N3A2-55PV-6331B)	5.5	① EPQ-55R-8671A ② EPQ-B55R-8685A	JAQ-03PQR-55-8682(3m) JAQ-05PQR-55-8682(5m)
NPQ-80-75PZ70N4A2-6161B (UPQ-3A-70N4A2-75PZ-6331B)	7.5	① EPQ-75R-8671A ② EPQ-B75R-8685A	JAQ-03PQR-75-8682(3m) JAQ-05PQR-75-8682(5m)
NPQ-100-11KPZ70N4A2-6161B (UPQ-3A-70N4A2-11KPZ-6331B)	11.0	① EPQ-11KR-8671A ② EPQ-B11KR-8685A	JAQ-03PQR-11K-8682(3m) JAQ-05PQR-11K-8682(5m)
NPQ-120-15KPZ70N4A2-6161B (UPQ-3A-70N4A2-15KPZ-6331B)	15.0	① EPQ-15KR-8671A ② EPQ-B15KR-8685A	JAQ-03PQR-15K-8682(3m) JAQ-05PQR-15K-8682(5m)

Note 1) Cable Kit details



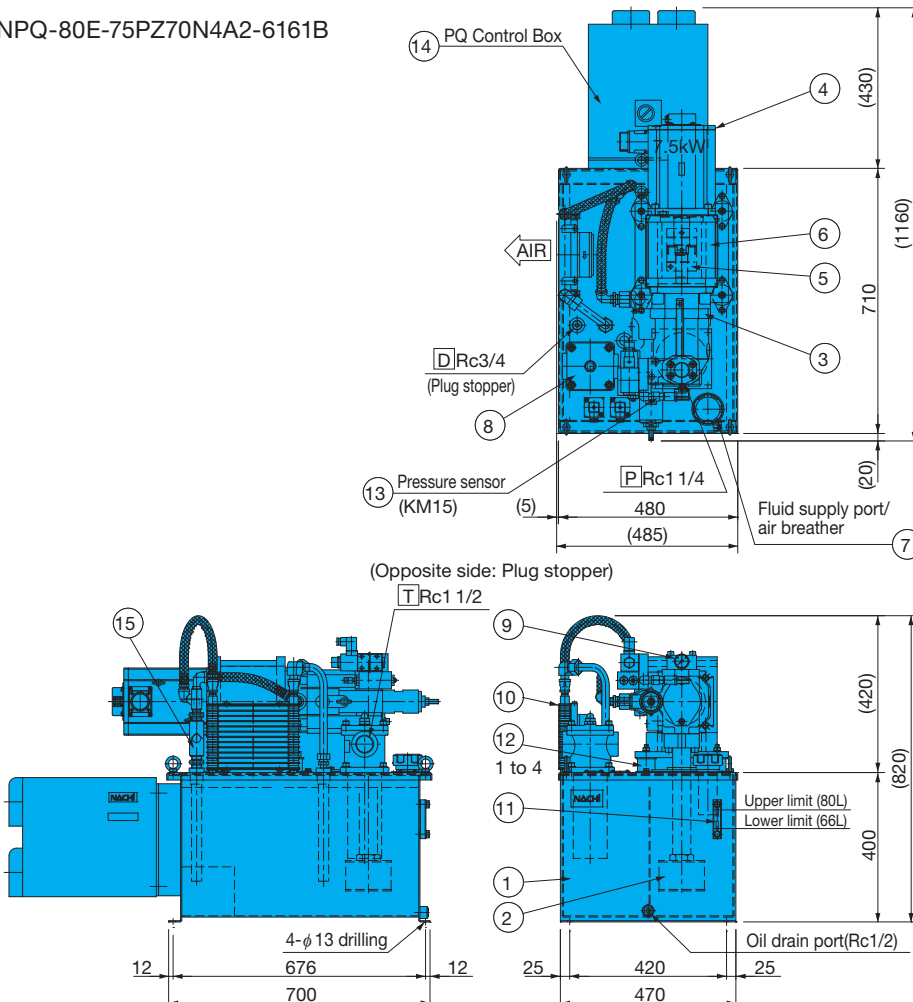
Design Drawings

NPQ-60E-55PV45N3A2-6161B



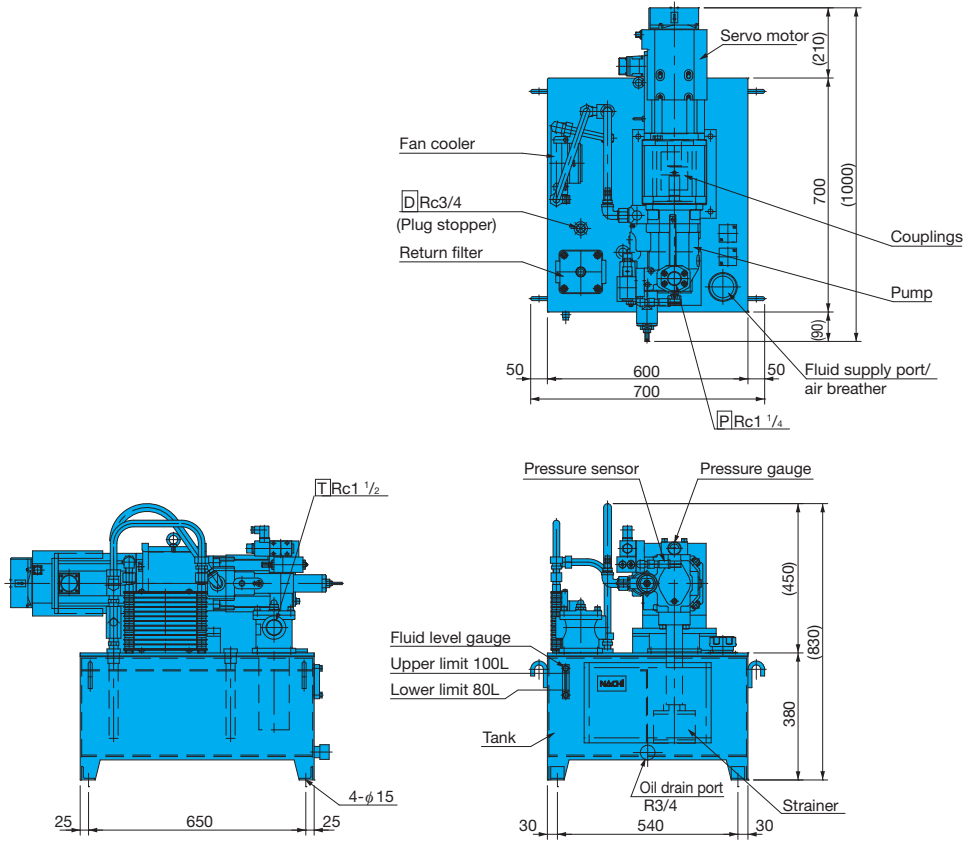
Part No.	Part Name	Q'ty
1	Tank	1
2	Strainer	1
3	Uni-pump	1
4	Servo motor	1
5	Coupling	1
6	Bracket	1
7	Fluid supply port/air breather	1
8	Return filter	1
9	Pressure gauge	1
10	Fan cooler	1
11	Fluid level gauge	1
12	Anti-vibration rubber	4
13	Pressure sensor	1
14	Servo control box	1
15	Check valve	1

NPQ-80E-75PZ70N4A2-6161B

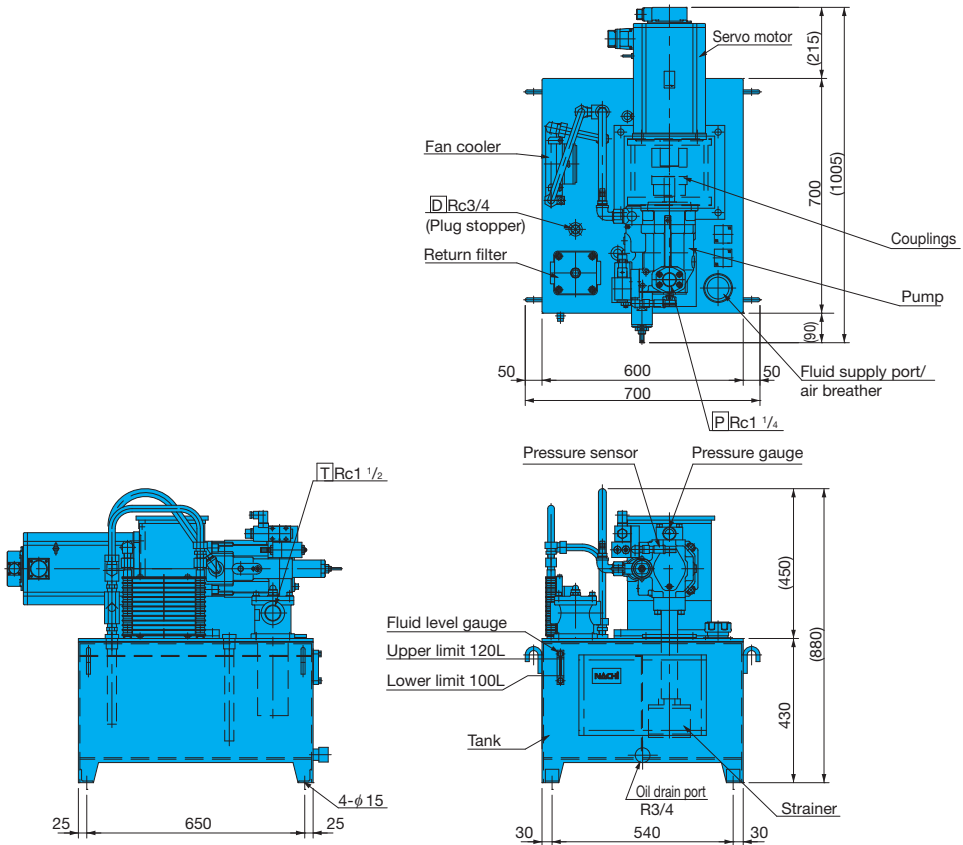


Part No.	Part Name	Q'ty
1	Tank	1
2	strainer	1
3	Uni-pump	1
4	Servo motor	1
5	Coupling	1
6	Bracket	1
7	Fluid supply port/air breather	1
8	Return filter	1
9	Pressure gauge	1
10	Fan cooler	1
11	Fluid level gauge	1
12	Anti-vibration rubber	4
13	Pressure sensor	1
14	PQ Control Box	1
15	Check valve	1

NPQ-100-11KPZ70N4A2-6161B



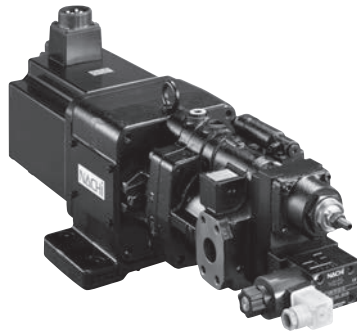
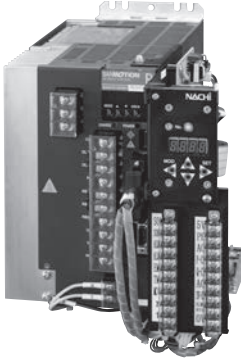
NPQ-120-15KPZ70N4A2-6161B



PQ Bellmount pump, PQ Amplifier unit

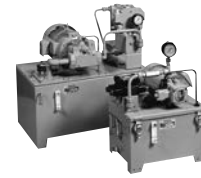
PQ Bellmount pumps, PQ Amplifier units of Power Fit are also available.
Please contact our sales agent.

PQ Amplifier unit for setting
inside the control panel



PQ Bellmount pump made by combining
a pump and servo motor.





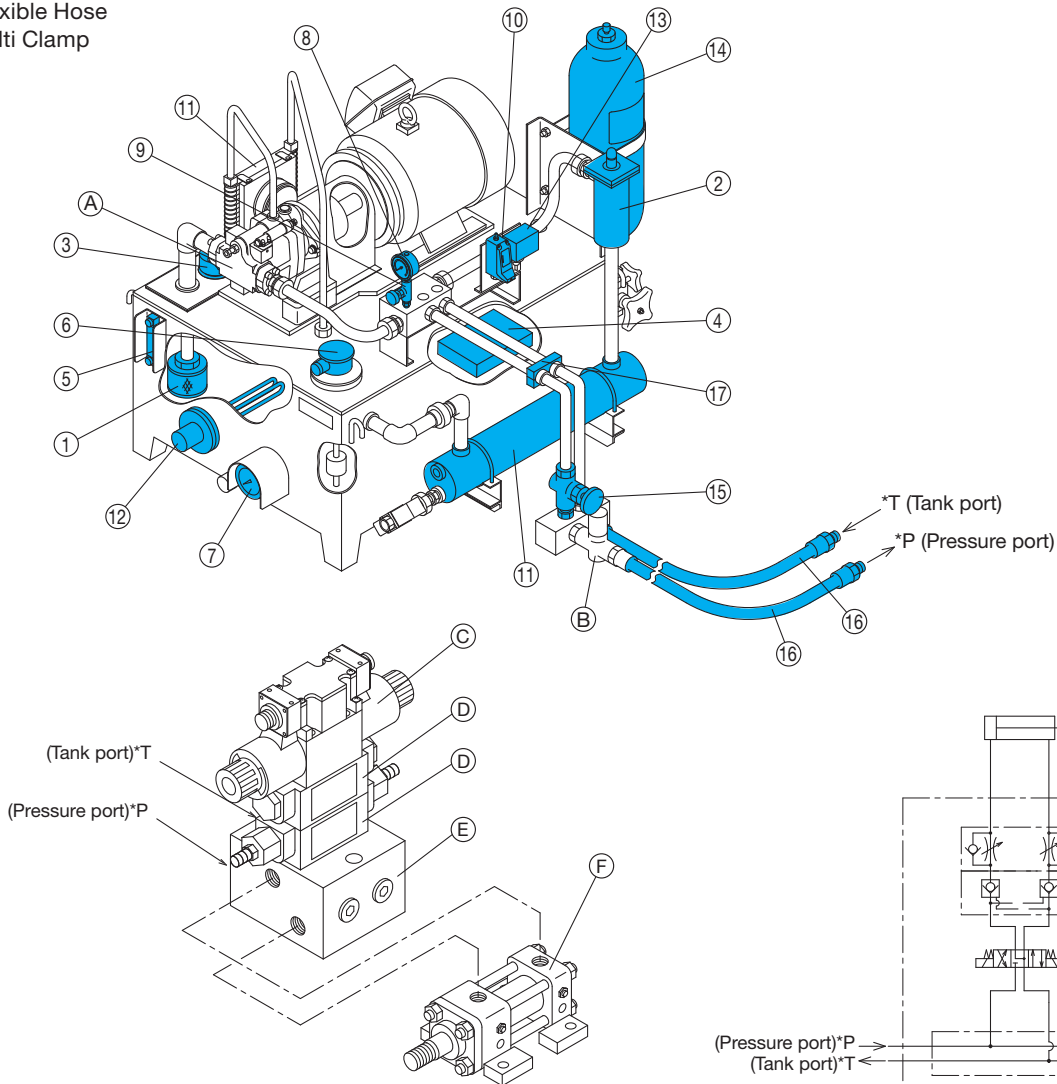
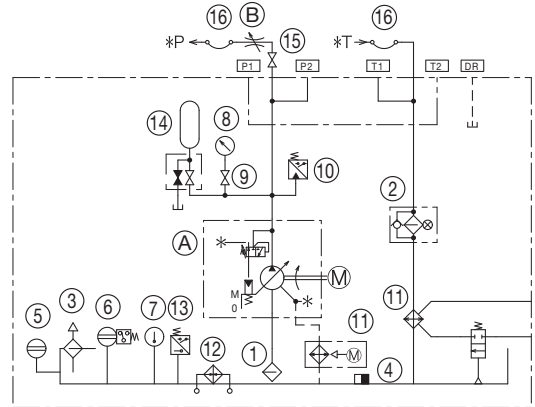
Hydraulic Accessories

Nachi hydraulic accessories are made possible through a long history of accumulated know-how, and provide you with the tools you need to configure the hydraulic circuits and systems you need.

Nachi accessories not only maximize the performance of your hydraulic system, they also provide you with the versatility to configure the simplest, most economical solution for virtually any type of system imaginable.

Use the illustration below to select the Nachi hydraulic accessories that best suit your needs.

- ① Strainer
 - ② Filter
 - ③ Air Breather
 - ④ Magnet Separator
 - ⑤ Fluid Level Gauge
 - ⑥ Fluid Switch
 - ⑦ Temperature Gauge
 - ⑧ Pressure Gauge
 - ⑨ Gauge Valve
 - ⑩ Pressure Switch
 - ⑪ Oil Cooler
 - ⑫ Heater
 - ⑬ Thermostat
 - ⑭ Accumulator
 - ⑮ Valves
 - ⑯ Flexible Hose
 - ⑰ Multi Clamp
- (A) Pump
 - (B) Throttle Valve
 - (C) Solenoid Valve
 - (D) Control Valve
 - (E) Base Block
 - (F) Hydraulic Cylinder



- For detailed specifications and dimensions of hydraulic accessories, see the "Hydraulic Accessories Catalog."
- Product not covered by ISO9001 registration

Operating Fluid

Operating fluid is liquid inside of a hydraulic device that acts as a medium to transmit power. In addition to its operational task, hydraulic operating fluid also performs

such tasks as lubrication, rust prevention, sealing, and cooling. Because of the vital contributions hydraulic operating fluid makes to the operation, efficiency, and

reliability of hydraulic equipment, it is important to exercise sufficient care when selecting the correct type for your needs and when storing fluid.

●Oil-based operating fluid

The most commonly used mineral oil hydraulic fluids are general operating fluid and anti-wear operating fluid.

General operating fluid is called "R&O type." It is made by adding oxidation inhibitors, rust inhibitors, foam inhibitors, and other additives to a highly refined paraffin base oil to enhance its characteristics.

Anti-wear operating fluid contains extreme pressure additives that enhances the extreme pressure characteristics required for high-pressure, high-speed hydraulic operations.

These oil-based operating fluid have a very wide range of application in hydraulic equipment, and account for most hydraulic operation fluid in use today.

●Fire-resistant Hydraulic Fluid

Fire-resistant hydraulic fluid (FRHF) is used in fire fighting equipment and in hydraulic equipment in applications where there is the danger of fire. There are two types of FRHF: watercontaining and synthetic.

The common types are water-glycol type and water in oil emulsion type

for water-containing FRHF, and phosphate ester type and fatty acid ester type for synthetic FRHF.

Care is required when using an FRHF concerning seal material, paint and metal compatibility (see table below), and because their lubrication characteristics are different from those of mineral oil.

ⓄSee the pages for each hydraulic-device or contact your agent to findout if a fire-resistant hydraulic fluid can be used with a particular device.

Fire-resistant Hydraulic Fluid Seal Material Compatibility

Fluid	Water In Oil Emulsion	Water-glycol	Phosphate Ester	Fatty Acid Ester
Sea Material				
Nitril Rubber	○	○	×	○
E. P. R.	×	○	○	○
Fluro Rubber	○	×	○	○
Teflon	○	○	○	○
Butyl Rubber	×	○	△	×
Urethane Rubber	×	×	×	○
Silicon Rubber	×	×	○	○
Leather (Wax Sealed)	×	×	○	○
Beech N	○	○	×	○
Beech S	○	○	×	○

Fire-resistant Hydraulic Fluid Paint Compatibility

Fluid	Water In Oil Emulsion	Water-glycol	Phosphate Ester	Fatty Acid Ester
Paint				
Epoxy Resin	×	×	×	○
Vinyl Resin	×	×	×	○
Urethane Resin	×	×	×	○
Phtalic Resin	×	×	×	×
Phenolic Resin	×	×	×	×

Fire-resistant Hydraulic Fluid Metal Compa-tibility (△indicates partial problem.)

Fluid	Water In Oil Emulsion	Water-glycol	Phosphate Ester	Fatty Acid Ester
Metal				
Aluminum	○	×	△	○
Cast Iron	○	○	○	○
Steel	○	○	○	○
Brass	○	○	○	○
Copper	△	○	○	○
Magnesium	○	×	△	○
Cadmium	△	×	△	△
Zinc	△	×	○	△

Note) The △symbol indicates items that may have problems. For details, consult your agent or a hydraulic operating fluid manufacturer.
○symbol indicates items that may be used. ×symbol indicates not ok.

●General Properties of Hydraulic Fluid (Typical)

Item	Type	Oil-based operating fluid	Water-glycol	Water In Oil Emulsion	Phosphate Ester	Fatty Acid Ester
	Specific Gravity 15/4°C		0.876	1.072	0.890	1.152
Fire Point °C		242	None	None	262	257
Viscosity mm ² /s	40°C	45.8	45.5	67.9	36.4	43.6
	100°C	6.86	9.09	12.0	4.72	8.00
Viscosity index		105	206	146	110	165
Pour Point °C		-30	-40	-12.5	-20	-10 or less

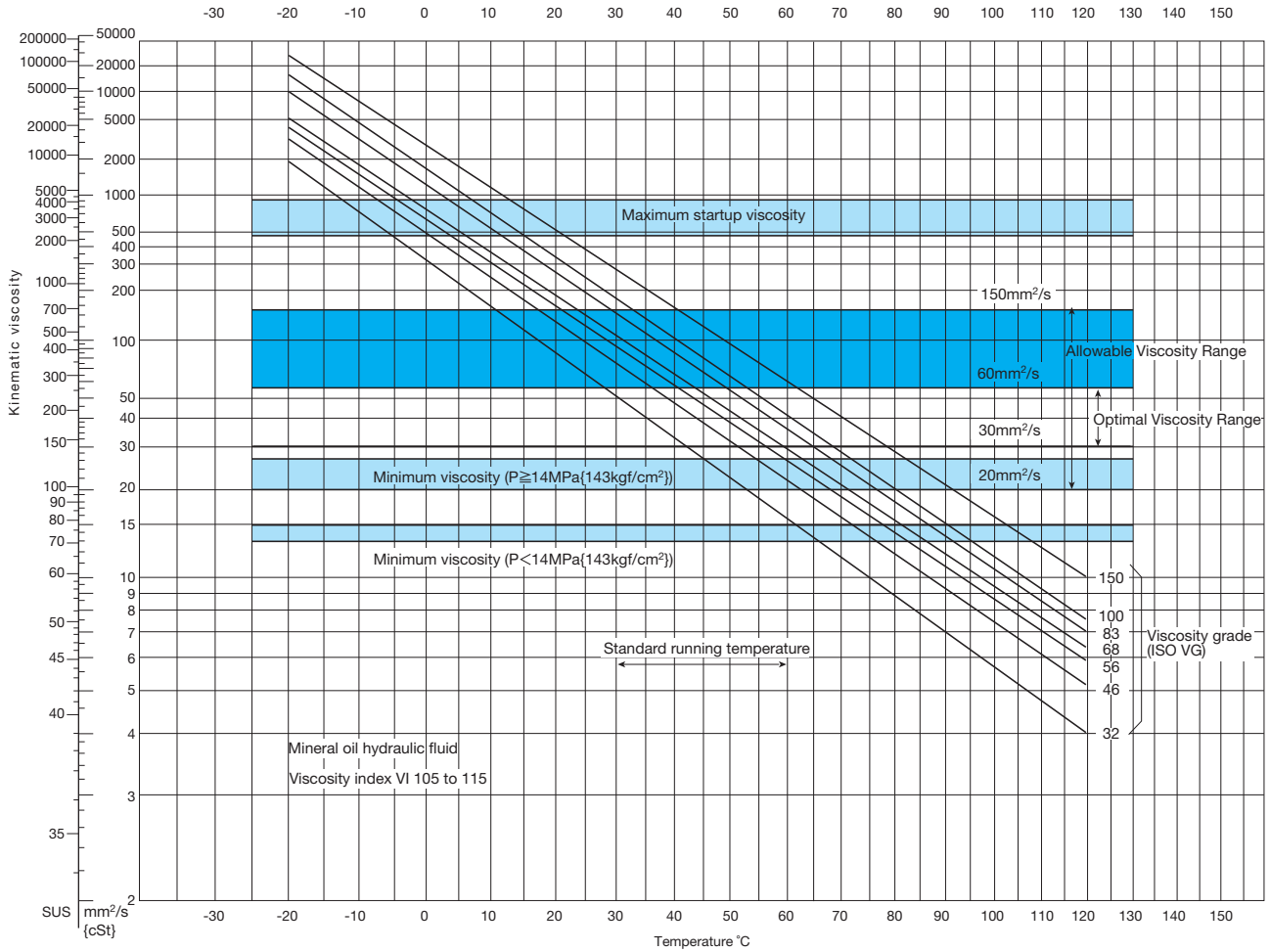
●Viscosity-Temperature Characteristics (Oil-based operating fluid)

Viscosity is the most important factor to consider when selecting hydraulic operating fluid. Viscosity has a major effect on a variety of characteristics, including the volumetric efficiency, mechanical efficiency, and pipe resistance, valve leakage, operational characteristics, etc.

Though the overall efficiency and characteristics of the hydraulic device should be considered when determining the proper viscosity of the fluid, the main consideration should be the needs of the hydraulic pump at the heart of the hydraulic system.

The following pages show typical Vis-

cosity-Temperature characteristics for oil-based operating fluid with viscosity indexes from 105 to 115, as well as ASTM Viscosity Index-Temperature tables with information about suitable and optimal viscosity ranges for hydraulic pumps.



● Fluid Cleanliness Levels

Today's high-pressure, high-speed, high-precision control hydraulic equipment is more susceptible than ever before to problems caused by hydraulic fluid contaminants. Fluid contaminants can cause a loss of machine performance, shorten machine life, and even lead to equipment malfunction. Because of this, the U.S. has taken the lead in defining numeric contamination limits to govern cleanliness levels for hydraulic operating fluid. Japan also applies the same standards (normally, NAS-1638) to classify fluid contamination limits. In the future, the world standard ISO cleanliness codes (ISO 4406) will use a range code to define the cumulative number of particles by diameter per milliliter. The range codes are separated by a slash in order of the diameter of the particle: larger than 4 μm (C), larger than 6 μm (C), and larger than 14 μm (C).

For example

- Larger than 4 μm (C) 1200 particles/ml
- Larger than 6 μm (C) 300 particles/ml
- Larger than 14 μm (C) 40 particles/ml

The cleanliness code looks like: 17/15/12

Allowable Number of Particles in Hydraulic Fluid–NAS-1638 (100ml)

Particle Size	Particle Size					Device	Filter	Remarks
	5 to 15 μm	15 to 25 μm	25 to 50 μm	50 to 100 μm	100 μm or larger			
Class								
00	125	22	4	1	0			
0	250	44	8	2	0			
1	500	89	16	3	1			
2	1,000	178	32	6	1			
3	2,000	356	63	11	2			
4	4,000	712	126	22	4			
5	8,000	1,425	253	45	8			
6	16,000	2,850	506	90	16			
7	32,000	5,700	1,012	180	32	↓ Electric-Hydraulic Servo Device	From nominal 0.8 μm to absolute 3 μm	↓ Clean oil ↓ NC hydraulic fluid
8	64,000	11,400	2,025	360	64			
9	128,000	22,800	4,050	720	128			
10	256,000	45,600	8,100	1,440	256	↓ Electric-Hydraulic Pulse Motor	From nominal 10 μm to absolute 40 μm	↓ In drum General hydraulic fluid (new)
11	512,000	91,200	16,200	2,880	512			
12	1,024,000	182,400	32,400	5,760	1,024	↓ General Industrial Hydraulic Device		

Weight of Contaminants Per 100 ml of Hydraulic Fluid–NAS-1638

Class	100	101	102	103	104	105	106	107	108
Weight mg	0.02	0.05	0.01	0.30	0.50	0.70	1.0	2.0	4.0

ISO Contamination Limit Equivalents (ISO 4406:1999) Number of particles show upper limit values for each scale number.

Number of Particles (Particles/ml)	Scale Number	Number of Particles (Particles/ml)	Scale Number	Number of Particles (Particles/ml)	Scale Number
2,500,000 +	>28	5,000	19	5	9
2,500,000	28	2,500	18	2.25	8
1,300,000	27	1,300	17	1.3	7
640,000	26	640	16	0.64	6
320,000	25	320	15	0.32	5
160,000	24	160	14	0.16	4
80,000	23	80	13	0.08	3
40,000	22	40	12	0.04	2
20,000	21	20	11	0.02	1
10,000	20	10	10	0.01 or less	0

Water-Glycol Type Operating Fluid Hydraulic Devices

Water-Glycol Type Operating Fluid Hydraulic Pump Specifications

Use the following tables to select the appropriate type of pump when using a water-glycol type hydraulic operating fluid.

1. PVS, PZS Series Variable Piston Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm ² }	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Revolution Speed min ⁻¹	Suction Pressure MPa{kgf/cm ² }
W-PVS-0B - 8N*-30	14 {143}	14 {143}	1200	-0.01{-0.1} or larger
W-PVS-1B - 16N*-12 - 22N*-	14 {143} 10.5{107}	14 {143} 10.5{107}	1200	-0.01{-0.1} or larger
W-PVS-2B - 35N*-12 - 45N*-	14 {143} 10.5{107}	14 {143} 10.5{107}	1200	-0.01{-0.1} or larger
W-PZS-3B - 70N*-10	14 {143}	14 {143}	1200	-0.01{-0.1} or larger
W-PZS-4B -100N*-10	14 {143}	14 {143}	1200	-0.01{-0.1} or larger
W-PZS-5B -130N*-10	14 {143}	14 {143}	1200	-0.01{-0.1} or larger

Note 1) Keep oil temperature between 10 and 50°C when operating.

Note 2) We recommend periodic maintenance of the PVS, PZS Series Variable Piston Pump.

Water- or glycol-based hydraulic operating fluids lack in lubricity compared to general mineral oils, which makes the life of the pump (the life of the rolling-element bearing) short.

2. VDR22 Design Series Variable Vane Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm ² }	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Revolution Speed min ⁻¹	Suction Pressure MPa{kgf/cm ² }
W-VDR-1*-1A2-22 -1A3- -2A2- -2A3-	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	1800	-0.015 to +0.03 {-0.15 to +0.3}

Note) Keep oil temperature between 15 and 55°C when operating.

3. VDC Series Variable Vane Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm ² }	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Revolution Speed min ⁻¹	Suction Pressure MPa{kgf/cm ² }
W-VDC-1*-1A2-20 -1A3- -2A2- -2A3-	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	1800	-0.015 to +0.03 {-0.15 to +0.3}
W-VDC-2*-1A2-20 -1A3- -2A2- -2A3-	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	3.5{35.7} 7 {71.4} 3.5{35.7} 5 {51 }	1800	-0.015 to +0.03 {-0.15 to +0.3}
W-VDC-3*-1A2-20 -1A3-	3.5{35.7} 7 {71.4}	3.5{35.7} 7 {71.4}	1800	-0.015 to +0.03 {-0.15 to +0.3}

Note) Keep oil temperature between 15 and 55°C when operating.

4. IPH Series IP Pump

W/G Pump Type	Rated Voltage MPa{kgf/cm ² }	Maximum Working Pressure MPa{kgf/cm ² }	Maximum Revolution Speed min ⁻¹	Suction Pressure MPa{kgf/cm ² }
W-IPH-2*-*-11	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-3*-*-20	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-4*-*-20	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-5*-*-21(11)	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}
W-IPH-6*-*-21(11)	21{214}	25 {255}	1200	-0.015 to +0.03{-0.15 to +0.3}

Note) • Use the air bleed off valve to bleed air during test running.

CAB-T02-*-11 maximum operating pressure 25MPa (255kgf/cm²)

• Keep oil temperature between 15 and 55°C when operating.

Water-Glycol Type Operating Fluid Hydraulic Valve Specifications

Use the following tables to select the appropriate type of hydraulic valves when using a water-glycol type hydraulic operating fluid.

1. Pressure Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Relief valve	R-⊙03-* ⁻ 12 R-⊙06-* ⁻ 20 R-⊙10-* ⁻ 20	21MPa{214kgf/cm ² }	(Note) 30(20)ℓ/min 150 340
Relief valve	RI-G03-* ⁻ 20 RI-G06-* ⁻ 20	21MPa{214kgf/cm ² }	(Note) 120(30)ℓ/min 260
Remote Control Relief Valve	RCD-T02-* ⁻ 11 RC-T02-* ⁻ 12 RC-G02-* ⁻ 21	21MPa{214kgf/cm ² }	15ℓ/min 2 2
Solenoid Controlled Relief Valve	RSA-⊙03-*** ⁻ 15 RSA-⊙06-*** ⁻ 23 RSA-⊙00-*** ⁻ 23 RSS-⊙03-*** ⁻ 15 RSS-⊙06-*** ⁻ 23 RSS-⊙10-*** ⁻ 23	21MPa{214kgf/cm ² }	30ℓ/min 150 340 30 150 340
Solenoid Controlled Relief Valve	RIS-G03-*** ⁻ 21 RIS-G06-*** ⁻ 21	21MPa{214kgf/cm ² }	120ℓ/min 260
Pressure Reducing (and Check) Valve	W-(C)G-⊙03-* ⁻ 21 W-(C)G-⊙06-* ⁻ 21 W-(C)G-⊙10-* ⁻ 21	21MPa{214kgf/cm ² }	(Note) 40(20)ℓ/min 100 250
Balancing Valve	GR-G01-A* ⁻ 20 GR-G03-A*(B)-20	14MPa{143kgf/cm ² }	20ℓ/min 40
Pressure Control (and Check) Valve	(C)Q-⊙03-*** ⁻ 21 (C)Q-⊙06-*** ⁻ 21 (C)Q-⊙10-*** ⁻ 21	21MPa{214kgf/cm ² }	40ℓ/min 100 250

Note) Flow rate values in parentheses are for when the pressure adjusting range field indicated by the asterisk (*) is A, B, or C.

2. Direction Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Right Angle Check Valve	CA-⊙03-* ⁻ 20 CA-⊙06-* ⁻ 20 CA-⊙10-* ⁻ 20	21MPa{214kgf/cm ² }	40ℓ/min 110 320
In-line Check Valve	CN-T03-* ⁻ 11 CN-T06-* ⁻ 11 CN-T10-* ⁻ 11	21MPa{214kgf/cm ² }	30ℓ/min 75 190
Pilot Check Valve	CP-⊙03-* ⁻ 20 CP-⊙06-* ⁻ 20 CP-⊙10-* ⁻ 20	21MPa{214kgf/cm ² }	40ℓ/min 110 320
DMA Type Manual Valve	W-DMA-G01-*** ⁻ 20 W-DMA-G03-*** ⁻ 20	21MPa{214kgf/cm ² }	35ℓ/min 65
SA Wet Type Solenoid Valve	SA-G01-*** ⁻ 31 SA-G03-*** ⁻ (J)21 DSA-G04-*** ⁻ 22 DSA-G06-*** ⁻ 22	28MPa{286kgf/cm ² }	Note1) 85ℓ/min 250 500
SS Wet Type Solenoid Valve	SS-G01-*** ⁻ 31 SS-G03-*** ⁻ (J)22 DSS-G04-*** ⁻ 22 DSS-G06-*** ⁻ 22	28MPa{286kgf/cm ² }	Note1) 85ℓ/min 110 250 500
	SS-G01-*** ⁻ FR-*** ⁻ 31 SS-G03-*** ⁻ FR-*** ⁻ (J)22	21MPa{214kgf/cm ² }	Note1) 45ℓ/min 65
Fine Solenoid Valve	W-SF-G01-*** ⁻ 10	14MPa{143kgf/cm ² }	Note1) 34ℓ/min
Non-leak Type Solenoid Valve	SNH-G01-*** ⁻ 11 SNH-G03-*** ⁻ 10 SNH-G04-*** ⁻ 10 SNH-G06-*** ⁻ 10	31.5MPa{321kgf/cm ² }	Note1) 17ℓ/min 34 50 85
Gauge cock	K2-⊙02-10	21MPa{214kgf/cm ² }	—
	K2-⊙03/04-10	35MPa{357kgf/cm ² }	—

Note) 1. Maximum flow rate depends on the flow path. Use a maximum flow rate that is within 85% of the standard valve.
2. Wet type solenoid valves other than those noted above cannot be used with W/G.

3. Flow Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Throttle (and Check) Valve	(C)FR-03-10 (C)FR-06-10 (C)FR-10-10	21MPa{214kgf/cm ² }	30ℓ/min 75 190
FT Type Flow Control (and Check) Valve	(C)FT-G02-**-22 FT-G03-**-22	21MPa{214kgf/cm ² }	(Note)
F Type Flow Control (and Check) Valve	(C)F-G06-170-20 (C)F-G10-373-20	21MPa{214kgf/cm ² }	
TN Type Flow Control (and Check) Valve	(C)TN-G02-2-11 (C)TN-G02-8-11	10.5MPa{107kgf/cm ² }	
TS Type Flow Control (and Check) Valve	(C)TS-G01-2-11	10.5MPa{107kgf/cm ² }	
TL (TLT) Type Feed Control Valve	W-TL-G03-*-11 W-TL-G04-*-11 W-TLT-G04-*-11	7MPa{71kgf/cm ² }	

Note) Due to the hydraulic fluid gravity differential, maximum flow rate is about 15% less than standard.

4. Modular Valve

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Modular Type Relief Valve	OR-G01-**-20(21) OR-G03-**(J)50	21MPa{214kgf/cm ² }	30ℓ/min 65
Brake Modulator Valve	ORO-G01-**-20 ORO-G03-**(J)50	21MPa{214kgf/cm ² }	20ℓ/min 30
Direct Relief Modular Valve	ORD-G01-**-20 ORD-G03-*(J)50	21MPa{214kgf/cm ² }	20ℓ/min 30
Pressure Reducing Modular Valve	OG-G01-P*-21 OGB-G01-P*-20 W-OG-G03-P*(J)51 W-OG-G03-PC-(J)51	21MPa{214kgf/cm ² }	30ℓ/min 30 65 45
	OGS-G01-P*C-22	21MPa{214kgf/cm ² }	30ℓ/min
Pressure Reducing (and Check) Modular Valve	OG-G01-**-21 OGB-G01-**-20 W-OG-G03-**(J)51 OG-G03-*C-(J)51	21MPa{214kgf/cm ² }	30ℓ/min 30 65 45
Sequence Modular Valve	OQ-G01-P2-20 OQ-G03-P2*(J)50	21MPa{214kgf/cm ² }	30ℓ/min 65
Counter Balance Modular Valve	OCQ-G01-*1*-20 OCQ-G03-*1*(J)50	21MPa{214kgf/cm ² }	30ℓ/min 65
Flow Regulator Modular Valve	OY-G01-*-20 OCY-G01-P-20 OCY-G03-P-(J)50 OCY-G01-*-X/Y-20 OCY-G03-*-X/Y-(J)51	21MPa{214kgf/cm ² }	30ℓ/min 30 85 30 85
Flow Control Modular Valve	OF-G01-P20-20 OF-G03-P60-J50 OCF-G01-*40-X/Y-30 OCF-G03-*60-X/Y-(J)50	21MPa{214kgf/cm ² }	(Note)
Check Modular Valve	OC-G01-**-20(21) OC-G03-**(J)50	21MPa{214kgf/cm ² }	30ℓ/min 85
Vacuum Check Modular Valve	OCV-G01-W-20 OCV-G03-W-(J)-50	21MPa{214kgf/cm ² }	30ℓ/min 65
Pilot Operated Check Modular Valve	OCP-G01-**(F)-21 OCP-G03-**(J)50	21MPa{214kgf/cm ² }	30ℓ/min 85
04 Series Relief Modular Valve	ORH-G04-P*-10	31.5MPa{321kgf/cm ² }	250ℓ/min
04 Series Direct Relief Modular Valve	ORH-G04-D*-10	31.5MPa{321kgf/cm ² }	40ℓ/min
04 Series Reducing Modular Valve	OGH-G04-**-10	31.5MPa{321kgf/cm ² }	250ℓ/min
04 Series Counter Balance Modular Valve	OQH-G04-**-10	31.5MPa{321kgf/cm ² }	250ℓ/min
04 Series Flow Regulator Modular Valve	OYH-G04-**-10	31.5MPa{321kgf/cm ² }	250ℓ/min
04 Series Flow Control Modular Valve	OFH-G04-*200-X/Y-10	31.5MPa{321kgf/cm ² }	(Note)
04 Series Check Modular Valve	OCH-G04-**-10	31.5MPa{321kgf/cm ² }	250ℓ/min
04 Series Vacuum Check Modular Valve	OVH-G04-W-10	31.5MPa{321kgf/cm ² }	250ℓ/min
04 Series Pilot Check Modular Valve	OPH-G04-**-10	31.5MPa{321kgf/cm ² }	250ℓ/min

Note) Due to the hydraulic fluid gravity differential, maximum flow rate is about 15% less than standard.

5. Electro-hydraulic Control Valves

Name	W/G Valve Type	Specifications	
		Maximum Working Pressure	Maximum Flow Rate
Pilot Relief Valve	EPR-G01-*-12	28MPa{286kgf/cm ² }	1ℓ/min
Relief Valve	ER-G03-*-21 ER-G06-*-21	25MPa{255kgf/cm ² }	120ℓ/min 260
Relief and Reducing Valve	W-EGB-G03-*-11 W-EGB-G06-*-11	25MPa{255kgf/cm ² }	40ℓ/min 80
Flow Control Valve	(C)ES-G02-*- (F)-12 ES-G03-*- (F)-12 (C)ES-G06-250-11 ES-G10-500-(F)-11	21MPa{214kgf/cm ² }	(Note)
Load Sensing Flow Control Valve	ESR-G03-125-12 ESR-G03-125R*-12 ESR-G06-250-12 ESR-G06-250R*-12 ESR-G10-500-11 ESR-G10-500R*-11	25MPa{255kgf/cm ² }	(Note)
Flow Direction Control Valve	ESD-G01-***-12 ESD-G03-***-12 ESD-G04-***-12 ESD-G06-***-13	25MPa{255kgf/cm ² }	(Note)
Modular type reducing valve	EOG-G01-P*-11	25MPa{255kgf/cm ² }	25ℓ/min
Modular Type Flow Control Valve	EOF-G01-*25-11	21MPa{214kgf/cm ² }	(Note)

Note) 1. Due to the hydraulic fluid gravity differential, maximum flow rate is about 15% less than standard.

2. The ESH series high-speed response proportional valve does not support water or glycol-based hydraulic operating fluid.

SI Units and Conversion Formulas

Table 1: SI Base Units

Quantity	Name	Symbol
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric Current	ampere	A
Thermodynamic Temperature	kelvin	K
Amount of Substance	mole	mol
Luminous Intensity	candela	cd

Table 2 : SI Derived Units

Quantity	Name	Symbol
Plane Angle	radian	rad
Solid Angle	steradian	sr

Table 3: Derived SI Units with Special Names and Symbols

Quantity	Name	Symbol
Frequency	hertz	Hz
Force	newton	N
Pressure, stress	pascal	Pa
Energy, Work, Quantity of Heat	joule	J
Power, Radiant Flux	watt	W
Electric Charge, Quantity of Electricity	coulomb	C
Electric Potential Difference, Electromotive Force	volt	V
Capacitance	farad	F
Electric Resistance	ohm	Ω
Electric Conductance	siemens	S
Magnetic Flux	weber	Wb
Magnetic Flux Density	tesla	T
Inductance	henry	H
Celsius Temperature	degree Celsius*	$^{\circ}\text{C}$
Luminous Flux	lumen	lm

* $t^{\circ}\text{C}=(t+273.15)\text{K}$

Table 4: SI Prefixes

Factor	Name	Symbol
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^9	giga	G
10^6	mega	M
10^3	kilo	k
10^2	hecto	h
10^1	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

Table 5: SI Derived Units whose Names and Symbols Include SI Derived Units with Special Names and Symbols

Quantity	Name	Symbol
Dynamic Viscosity	pascal second	Pa·s
Moment of Force	newton meter	N·m
Surface Tension	newton per meter	N/m
Heat Flux Density, Irradiance	watt per square meter	W/m ²
Heat Capacity, Entropy	joule per kelvin	J/K
Specific Heat Capacity, Specific Entropy*	joule per kilogram kelvin	J/(kg·K)
Thermal Conductivity	watt per meter kelvin	W/(m·K)
Permittivity	farad per meter	F/m
Permeability	henry per meter	H/m

*Also called weight entropy.

Table 6: Units Outside the SI but Accepted for Use with the SI

Name	Symbol	Value in SI Units
Minute (Time)	min	1min=60s
Hour	h	1h=60min=3,600s
Day	d	1d=24h=86,400s
Degree	$^{\circ}$	$1^{\circ}=(\pi/180)\text{rad}$
Minute (Angle)	'	$1'=(1/60)^{\circ}=(\pi/10,800)\text{rad}$
Second (Angle)	"	$1''=(1/60)'=(\pi/648,000)\text{rad}$
Liter	ℓ	$1\ell=1\text{dm}^3=10^{-3}\text{m}^3$
Ton	t	$1\text{t}=10^3\text{kg}$

Force

N	dyn	kgf
1	1×10^5	1.020×10^{-1}
1×10^{-5}	1	1.020×10^{-6}
9.807	9.807×10^5	1

(Note) $1 \text{ dyn} = 10^{-5} \text{ N}$

Torque

N-m	kgf-m	gf-cm
1	1.020×10^{-1}	1.020×10^4
9.807	1	1×10^5
9.807×10^{-5}	1×10^{-5}	1

Pressure

Pa	MPa	bar	kgf/cm ²	atm	mHg	mH ₂ O
1	1×10^{-6}	1×10^{-5}	1.019×10^{-5}	9.869×10^{-6}	7.501×10^{-6}	1.020×10^{-4}
1×10^6	1	1×10	1.019×10	9.869	7.501	1.020×10^2
1×10^5	1×10^{-1}	1	1.020	9.869×10^{-1}	7.501×10^{-1}	1.020×10
9.807×10^4	9.807×10^{-2}	9.807×10^{-1}	1	9.678×10^{-1}	7.356×10^{-1}	1×10
1.013×10^5	1.013×10^{-1}	1.013	1.033	1	7.60×10^{-1}	1.033×10
1.333×10^5	1.333×10^{-1}	1.333	1.360	1.316	1	1.360×10
9.807×10^3	9.807×10^{-3}	9.807×10^{-2}	1×10^{-1}	9.678×10^{-2}	7.355×10^{-2}	1

(Note) $1 \text{ Pa} = 1 \text{ N/m}^2$

Work, Energy, Quantity of Heat

J	kgf-m	kW-h	kcal
1	1.02×10^{-1}	2.778×10^{-7}	2.389×10^{-4}
9.807	1	2.724×10^{-6}	2.343×10^{-3}
3.60×10^6	3.671×10^5	1	8.60×10^2
4.186×10^3	4.269×10^2	1.163×10^{-3}	1

(Note) $1 \text{ J} = 1 \text{ W} \cdot \text{s}$. $1 \text{ kgf} \cdot \text{m} = 9.807 \text{ J}$. $1 \text{ W} \cdot \text{h} = 3600 \text{ W} \cdot \text{s}$. $1 \text{ cal} = 4.186 \text{ J}$

Heat Transfer Coefficient

W/m ² ·K	kcal/m ² ·h·°C	cal/cm ² ·s·°C
1	8.60×10^{-1}	2.389×10^{-5}
1.163	1	2.778×10^{-5}
4.186×10^4	3.60×10^4	1

Thermal Conductivity

W/m·K	kcal/m·h·°C	J/cm·s·°C
1	8.60×10^{-1}	1×10^{-2}
1.163	1	1.163×10^{-2}
1×10^2	8.60×10	1

Power, Radiant Flux

W	kW	kgf-m/s	kcal/s
1	1×10^{-3}	1.020×10^{-1}	2.389×10^{-4}
1×10^3	1	1.020×10^2	2.389×10^{-1}
9.807	9.807×10^{-3}	1	2.343×10^{-3}
4.186×10^3	4.186	4.269×10^2	1

(Note) $W = 1 \text{ J/s}$. $1 \text{ kgf} \cdot \text{m/s} = 9.807 \text{ W}$

Dynamic Viscosity

Pa·s	P (Poise)	cP
1	1×10	1×10^3
1×10^{-1}	1	1×10^2
1×10^{-3}	1×10^{-2}	1

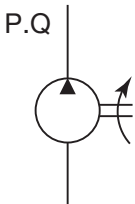
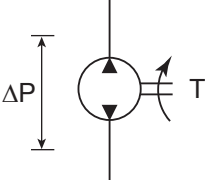
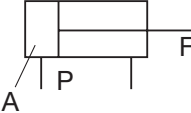
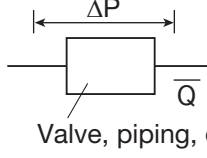
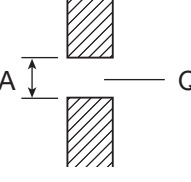
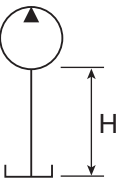
Flow rate

m ³ /s	m ³ /h	ℓ/min	gal(US)/min
1	3.6×10^3	6×10^4	1.585×10^4
2.778×10^{-4}	1	1.667×10	4.403
1.667×10^{-5}	6×10^{-2}	1	2.642×10^{-1}
6.304×10^{-5}	2.271×10^{-1}	3.782	1

Kinematic viscosity

m ² /s	St	cSt
1	1×10^4	1×10^6
1×10^{-4}	1	1×10^2
1×10^{-6}	1×10^{-2}	1

(Note) $1 \text{ cSt} = 1 \text{ mm}^2/\text{s}$

	Item	SI units	Power (engineering) units
Requirement		$L = \frac{P \cdot Q}{60 \times \eta}$ <p>L : Power Requirement [kW] P : Discharge Pressure [MPa] Q : Discharge Rate [ℓ/min] η : Pump Efficiency</p>	$L = \frac{P \cdot Q}{612 \times \eta}$ <p>L : Power Requirement [kW] P : Discharge Pressure [kgf/cm²] Q : Discharge Rate [ℓ/min] η : Pump Efficiency</p>
Oil Motor Output Torque		$L = \frac{\Delta P \cdot q}{2\pi} \times \eta$ <p>T : Output Torque [N·m] ΔP: Inlet/Outlet Pressure Differential [MPa] q : Volume per Oil Motor Turn [cm³] η : Torque Efficiency</p>	$L = \frac{\Delta P \cdot q}{200 \times \pi} \times \eta$ <p>T : Output Torque [kgf·m] ΔP: Inlet/Outlet Pressure Differential [kgf/cm²] q : Volume per Oil Motor Turn [cm³] η : Torque Efficiency</p>
Cylinder Output		$F = 100 \times P \times A \times \eta$ <p>F : Cylinder Output [N] P : Working Pressure [MPa] A : Cylinder Contact Area [cm²] η : Cylinder Efficiency</p>	$F = P \times A \times \eta$ <p>F : Cylinder Output [kgf] P : Working Pressure [kgf/cm²] A : Cylinder Contact Area [cm²] η : Cylinder Efficiency</p>
Pressur Loss Conversion Energy	 <p>Valve, piping, etc.</p>	$H = 60 \times P \times Q$ <p>H : Heat Release [kJ/h] P : Pressure Loss [MPa] Q : Flow Rate [ℓ/min]</p>	$H = 1.4 \times P \times Q$ <p>H : Heat Release [kcal/h] P : Pressure Loss [kgf/cm²] Q : Flow Rate [ℓ/min]</p>
Orifice Flow		$Q = CA \sqrt{\frac{2\Delta P}{\rho}} \times 6000$ <p>Q : Flow Rate [ℓ/min] C : Compressible Flow Coefficient [Dimensionless] A : Passage Area [cm²] ΔP: Pressure Differential [MPa] ρ : Density [kg/m³]</p>	$Q = CA \sqrt{\frac{2g \cdot \Delta P}{\gamma}} \times 0.06$ <p>Q : Flow Rate [ℓ/min] C : Compressible Flow Coefficient [Dimensionless] (≈0.6) A : Passage Area [cm²] g : Gravitational Acceleration [980cm/s²] ΔP: Pressure Differential [kgf/cm²] γ : Specific Gravity [kgf/cm³] (≈0.87×10⁻³)</p>
Pressure Loss		$\Delta P = \rho \times g \times H \times 10^{-6}$ <p>ΔP: Pressure Loss [MPa] ρ : Density [kg/m³] g : Gravitational Acceleration [9.8m/s²] H : Height [m]</p>	$\Delta P = \gamma \times g \times H \times 10^{-4}$ <p>ΔP: Pressure Loss [kg/m²] γ : Specific Gravity [kgf/cm³] H : Height [m]</p>

(Note) When performing calculations, make sure that you first convert values correctly. Cutting off and rounding up values can cause differences in calculation results.

Model No. Index

(alphabetic sequence)

Note) *Indicates value and symbol entries, but due to the amount of model numbers, they have been eliminated from this item. See the items in the catalog for specific details.

B

BRC41-01WC2	D-56
BRC41-01WD2	D-56

C

CAB-T02-1-11	C-13
CA-F**-*30	H-10
CA-G03-*20	H-1
CA-G06-*20	H-1
CA-G10-*20	H-1
CA-T03-*20	H-1
CA-T06-*20	H-1
CA-T10-*20	H-1
CES-G02*-(F)-12	I-8
CES-G06-250-11	I-8
CF-G06-170-20	G-8
CF-G10-373-20	G-8
CFR-F**-*30	H-10
CFR-G03-10	G-1
CFR-G06-10	G-1
CFR-G10-10	G-1
CFR-T03-10	G-1
CFR-T06-10	G-1
CFR-T10-10	G-1
CFT-G02*-*22	G-4
CG-G03*-*21	F-18
CG-G06*-*21	F-18
CG-G10*-*21	F-18
CG-T03*-*21	F-18
CG-T06*-*21	F-18
CG-T10*-*21	F-18
CN-T03*-*11	H-1
CN-T06*-*11	H-1
CN-T10*-*11	H-1
CP-F**-*-*30	H-10
CP-G03*-(F)-20	H-4
CP-G03*-(B(F))-20	H-4
CP-G06*-(F)-20	H-4
CP-G06*-(B(F))-20	H-4
CP-G10*-(F)-20	H-4
CP-G10*-(B(F))-20	H-4
CP-T03*-(F)-20	H-4
CP-T03*-(B(F))-20	H-4
CP-T06*-(F)-20	H-4
CP-T06*-(B(F))-20	H-4
CP-T10*-(F)-20	H-4
CP-T10*-(B(F))-20	H-4
CQ-G03**-*21	F-25
CQ-G06**-*21	F-25
CQ-G10**-*21	F-25
CQ-T03**-*21	F-25
CQ-T06**-*21	F-25
CQ-T10**-*21	F-25
CTN-G02*-*11	G-11
CTN-G02*-(F)-11	G-11
CTS-G01-2-11	G-14

D

DMA-G01***-20	H-8
---------------	-----

DMA-G03***-(J)20
 DMA-G03***-20
 DSA-G04***-(R)**-22
 DSA-G06***-(R)**-22
 DSS-G04***-(R)**-22
 DSS-G06***-(R)**-22

E

EA41-1A	E-19
EA41-DR*1C	E-19
EA41-GRC*1C	E-19
EA41-GRD*1C	E-19
EA41-R*1C	E-19
EA42-1B	E-19
EA42-R*1B	E-19
EAC64-C*	E-15
EAC64-D*	E-15
EAC64-E*	E-15
EA-PD4***-10	I-44
EBA-PD1-N(Z)-D2-10	I-30
EBA-PD1-N-C1-10	I-30
EBA-PD1-NW(Z)-D2-10	I-30
EBA-PD1-NW-C1-10	I-30
EBB64-C*	E-15
EBB64-D*	E-15
EBB64-E*	E-15
EBK-20-*K-21	L-25
EBK-30-*K-21	L-25
EBK-40-*K-21	L-25
ECB64-C*	E-3
ECB64-D*	E-3
ECB64-E*	E-3
EDA-PD1-NWZ-D2-11	I-34
EDC64-C*	E-3
EDC64-D*	E-3
EDC64-E*	E-3
EDC-PC6-AWZ-D2-20	I-34
EGB-G03*-*11	I-6
EGB-G06*-*11	I-6
EHA-PD2****-D2-10	I-42
EMA-PD5-N-20	I-26
EMC-PC6-A-20	I-26
EOF-G01-*25-11	I-24
EOG-G01-P*-11	I-22
EPD-PC3-10-D2-20	L-42
EPR-G01*-*-*12	I-2
ER-G03*-*21	I-4
ER-G06*-*21	I-4
ESD-G01***-12	I-14
ESD-G03***-(*)-12	I-14
ESD-G04***-(*)-12	I-14
ESD-G06***-(*)-13	I-14
ES-G02*-(F)-12	I-8
ES-G03*-(F)-12	I-8
ES-G06-250-11	I-8
ES-G10-500-(F)-11	I-8
ESH-G01-H5A-10	I-38
ESH-G03-D*****(*)-11	I-40
ESH-G04-D*****(*)-11	I-40
ESH-G06-D*****(*)-11	I-40
ESR-G03-125(**)-12	I-11
ESR-G06-250(**)-12	I-11
ESR-G10-500(**)-11	I-11

F

F-G06-170-20	G-8
F-G10-373-20	G-8
FJ-*****-21	K-1
FR-G03-10	G-1
FR-G06-10	G-1
FR-G10-10	G-1
FR-T03-10	G-1
FR-T06-10	G-1
FR-T10-10	G-1
FT-G02*-*22	G-4
FT-G03*-*22	G-4

(Page)
H-8
E-45
E-45
E-45
E-45

G

G-G03-*21	F-18
G-G06-*21	F-18
G-G10-*21	F-18
GR-G01-A*-20	F-23
GR-G03-A*(B)-20	F-23
G-T03*-*21	F-18
G-T06*-*21	F-18
G-T10*-*21	F-18

H

HF(S)-F10	J-1
HF(S)-F16	J-1
HF(S)-F24	J-1
HF(S)-G06	J-1
HF(S)-G10	J-1
HT(S)-G06	J-1
HT(S)-G10	J-1
HT(S)-G16	J-1
HY(S)-G06	J-1
HY(S)-G10	J-1

I

IHAS-2S****	C-9
IHF-22-T-20	C-10
IHF-23-T-20	C-10
IHF-24-T-20	C-10
IHF-25-T-20	C-10
IHF-26-T-20	C-10
IHF-2-T-20	C-10
IHF-33-T-20	C-10
IHF-34-T-20	C-10
IHF-35-T-20	C-10
IHF-36-T-20	C-10
IHF-3-T-20	C-10
IHF-44-T-20	C-10
IHF-45-T-20	C-10
IHF-46-T-20	C-10
IHF-4-T-20	A-41-C-10
IHF-5-E-20	B-30
IHF-5-T-20	A-41-B-30-C-10
IHF-6-T-20	C-10
IHF-7-T-10	A-41
IHM-2-10	A-18-C-12
IHM-22-10	C-12
IHM-4-10	A-18-C-12
IHM-44-10	A-41-C-12
IHM-45-10	B-36-C-12
IHM-46-10	C-12
IHM-55-10	A-34-A-41-C-12
IHM-66-10	C-12
IPH-22B-*-*(*)-11	C-14
IPH-23B-*-*(*)-11	C-14
IPH-24B-*-*(*)-11	C-14
IPH-25B-*-*(*)-11	C-14
IPH-26B-*-*(*)-11	C-14
IPH-2A(B)*-*11	C-1
IPH-33B-*-*(*)-11	C-14
IPH-34B-*-*(*)-11	C-14
IPH-35B-*-*(*)-11	C-14
IPH-36B-*-*(*)-11	C-14
IPH-3A(B)*-*20	C-1
IPH-44B-*-*(*)-11	C-14
IPH-45B-*-*(*)-11	C-14
IPH-46B-*-*(*)-11	C-14
IPH-4A(B)*-*20	C-1
IPH-55B-*-*(*)-11	C-14
IPH-56B-*-*(*)-11	C-14
IPH-5A(B)*-*21(11)	C-1
IPH-66B-*-*(*)-11	C-14
IPH-6A(B)*-*21(11)	C-1

(Page)

	(Page)
OQH-G04-*1*-10	D-50
ORD-G01-*2*-20	D-23
ORD-G03-*2*-J50	D-23
OR-G01-*2*-20	D-13
OR-G01-*2*-21	D-13
OR-G03-*2*-J50	D-13
OR-G03-P*(V)-J50	D-13
ORH-G04-DA*-10	D-23
ORH-G04-DB*-10	D-23
ORH-G04-DW*-10	D-23
ORH-G04-P*-10	D-13
ORO-G01-*2*-20	D-19
ORO-G03-*2*-J50	D-19
OTD-01-*1*-10	D-93
OTD-03-*1*-30	D-93
OTD-03-*1*-J30	D-93
OTD-04-*1*-10	D-94
OTH-01-*1*-10	D-93
OTH-03-*1*-30	D-93
OTH-03-*1*-J30	D-93
OTH-04-*1*-10	D-94
OVH-G04-W-10	D-72
OW-G01-*2*-20	D-55
OY-G01-T-20	D-58
OYH-G04-*2*-10	D-58
OYH-G04-P-10	D-58

P

PJF-10300E	A-34
PJF-10300T	A-34
PJF-10400E	A-34
PJF-10400T	A-34
PJF-10500E	A-34
PJF-10500T	A-34
PJF-10600E	A-34
PJF-10600T	A-34
PSCF-100000	A-18
PSF-101000	A-18
PSF-102000	A-18
PVS-0B-8*-30	A-3
PVS-1B-16*-*(*)-12	A-3
PVS-1B-22*-*(*)-12	A-3
PVS-2B-35*-*(*)-12	A-3
PVS-2B-45*-*(*)-12(20)	A-3
PZ-2B-*35E*A-11	A-35
PZ-2B-*45E*A-11	A-35
PZ-3B-*70E*A-10	A-35
PZ-4B-*100E*A-10	A-35
PZ-5B-*130E*A-10	A-35
PZ-6B-*180E*A-20	A-35
PZ-6B-*220E*A-20	A-35
PZF-4-T-10	A-41
PZF-6-T-10	A-41
PZM-3-10	A-34
PZM-4-10	A-34:A-41
PZS-3B-70*-10	A-22
PZS-4B-100*-10	A-22
PZS-5B-130*-10	A-22
PZS-6B-180*-10	A-22
PZS-6B-220*-10	A-22

Q

Q-G03-*2*-21	F-25
Q-G06-*2*-21	F-25
Q-G10-*2*-21	F-25
Q-T03-*2*-21	F-25
Q-T06-*2*-21	F-25
Q-T10-*2*-21	F-25

R

RCD-T02-*1*-11	F-8
RC-G02-*2*-21	F-8
RC-T02-*1*-12	F-8
R-G03-*1*-12	F-1
R-G06-*1*-20	F-1
R-G10-*1*-20	F-1
RI-G03-*1*-20	F-5
RI-G06-*1*-20	F-5
RIS-G03-*1*-F*-21	F-15
RIS-G03-AQ*-21	F-15
RIS-G03-AR*-21	F-15
RIS-G06-*1*-F*-21	F-15
RIS-G06-AQ*-21	F-15
RIS-G06-AR*-21	F-15
RSA-G03-*1*-F*-15	F-10
RSA-G03-AQ*-15	F-10
RSA-G03-AR*-15	F-10
RSA-G06-*1*-F*-23	F-10
RSA-G06-AQ*-23	F-10
RSA-G06-AR*-23	F-10
RSA-G10-*1*-F*-23	F-10
RSA-G10-AQ*-23	F-10
RSA-G10-AR*-23	F-10
RSA-T03-*1*-F*-15	F-10
RSA-T03-AQ*-15	F-10
RSA-T03-AR*-15	F-10
RSA-T06-*1*-F*-23	F-10
RSA-T06-AQ*-23	F-10
RSA-T06-AR*-23	F-10
RSA-T10-*1*-F*-23	F-10
RSA-T10-AQ*-23	F-10
RSA-T10-AR*-23	F-10
RSS-G03-*1*-F*-15	F-10
RSS-G03-AQ*-15	F-10
RSS-G03-AR*-15	F-10
RSS-G06-*1*-F*-23	F-10
RSS-G06-AQ*-23	F-10
RSS-G06-AR*-23	F-10
RSS-G10-*1*-F*-23	F-10
RSS-G10-AQ*-23	F-10
RSS-G10-AR*-23	F-10
RSS-T03-*1*-F*-15	F-10
RSS-T03-AQ*-15	F-10
RSS-T03-AR*-15	F-10
RSS-T06-*1*-F*-23	F-10
RSS-T06-AQ*-23	F-10
RSS-T06-AR*-23	F-10
RSS-T10-*1*-F*-23	F-10
RSS-T10-AQ*-23	F-10
RSS-T10-AR*-23	F-10
R-T03-*1*-12	F-1
R-T06-*1*-20	F-1
R-T10-*1*-20	F-1

S

SA-G01-A*-31	E-13
SA-G01-C*-31	E-13
SA-G01-E*-31	E-13
SA-G01-H*-31	E-13
SA-G03-A*-21	E-13
SA-G03-C*-21	E-13
SA-G03-E*-21	E-13
SA-G03-H*-21	E-13
SAW-G01-A*-11	E-66
SAW-G01-C*-11	E-66
SCW-G03-A*-J11	E-75
SE-G01-*2*-40	E-25
SE-G03-*2*-30	E-25
SED-G01-*2*-40	E-32
SF-G01-C*-R-D*-10	E-53
SL-G01-A*-R*-31	E-41
SL-G01-C*-R*-31	E-41
SL-G01-E*-R*-31	E-41
SL-G01-H*-R*-31	E-41
SNH-G01-*2*-11	E-57

(Page)

SNH-G03-*2*-10	E-57
SNH-G04-*2*-10	E-57
SNH-G06-*2*-10	E-57
SS-G01-A*-R*-31	E-1
SS-G01-C*-R*-31	E-1
SS-G01-E*-R*-31	E-1
SS-G01-H*-R*-31	E-1
SS-G03-A*-R*-J22	E-1
SS-G03-C*-R*-J22	E-1
SS-G03-E*-R*-J22	E-1
SS-G03-H*-R*-J22	E-1

T

TL-G03-*1*-11	G-16
TL-G04-*1*-11	G-16
TLT-G04-*1*-11	G-16
TN-G02-*1*-11	G-11
TN-G02-*1*-F-11	G-11
TS-G01-2-11	G-14

U

UPS-00A-****-20	L-35
UPS-0A-****-20	L-35
UPS-1A-****-20	L-35
UPV-0A-8*-4-50	A-19
UPV-1A-16*-4-30	A-19
UPV-1A-22*-4-30	A-19
UPV-1A-35*-4-30	A-19
UPV-1A-45*-4-30	A-19
USV-0A-A*-4-30	B-5
UVC-*A-A*-4-40	B-37
UVC-11A-A*-4-40	B-37
UVD-11A-A*-4-50	B-22
UVD-11A-A*-4-60	B-12
UVD-1A-A*-4-50	B-22
UVD-1A-A*-4-60	B-12
UVD-2A-A*-4-50	B-22
UVN-1A-A*-4-12	B-40
UVN-1A-A*-4-30	B-40

V

VCM-11-20	B-36
VCM-22-20	B-36
VDC-11A(B)-*A*-20	B-25
VDC-12A(B)-*A*-20	B-25
VDC-13A(B)-*A*-20	B-25
VDC-1A(B)-*A*-20	B-25
VDC-22A(B)-2A3-*A*-20	B-25
VDC-2A(B)-*A*-20	B-25
VDC-3A(B)-1A*-20	B-25
VDR-11A(B)-*A*-13	B-15
VDR-11A(B)-*A*-22	B-6
VDR-1A(B)-*A*-13	B-15
VDR-1A(B)-*A*-22	B-6
VDR-2A(B)-*A*-13	B-15
VDS-0A(B)-1A*-10	B-1

